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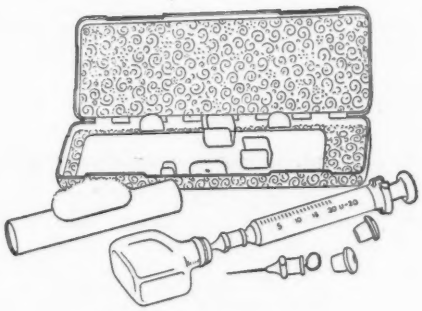

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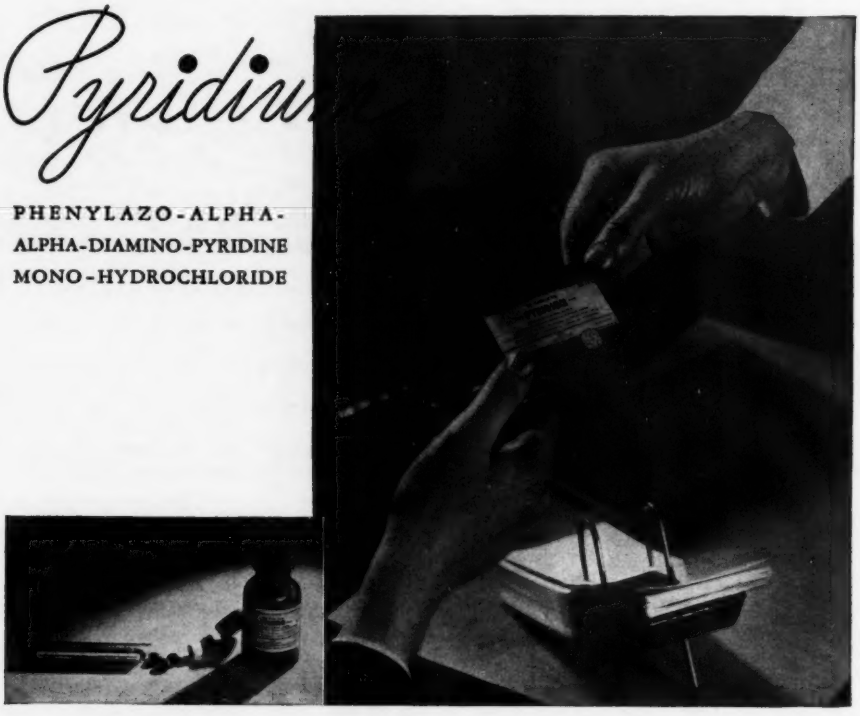

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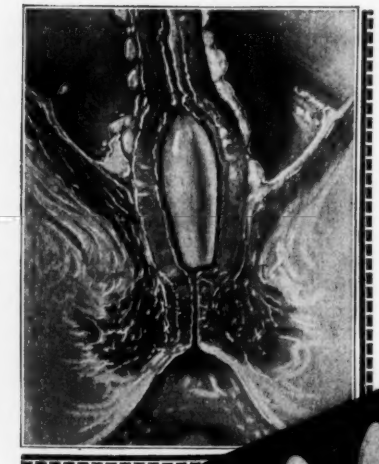

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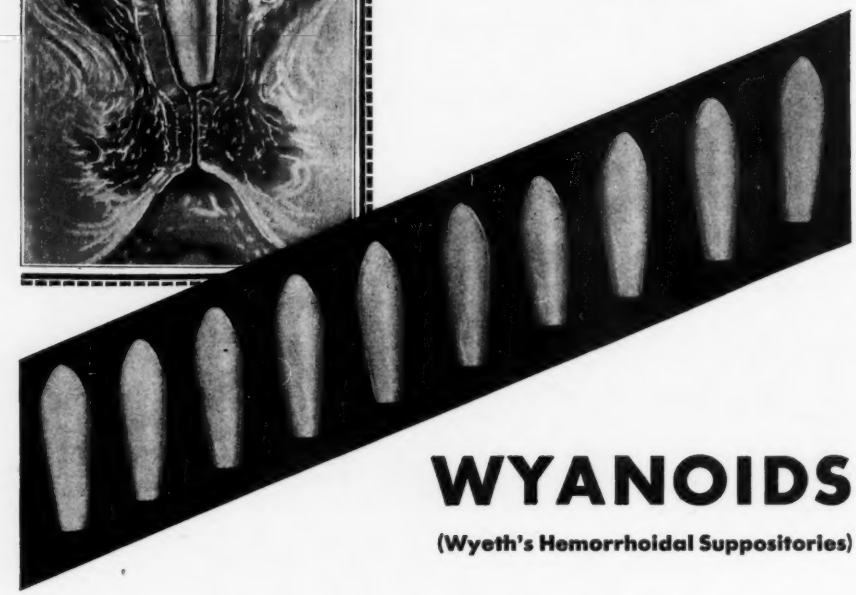

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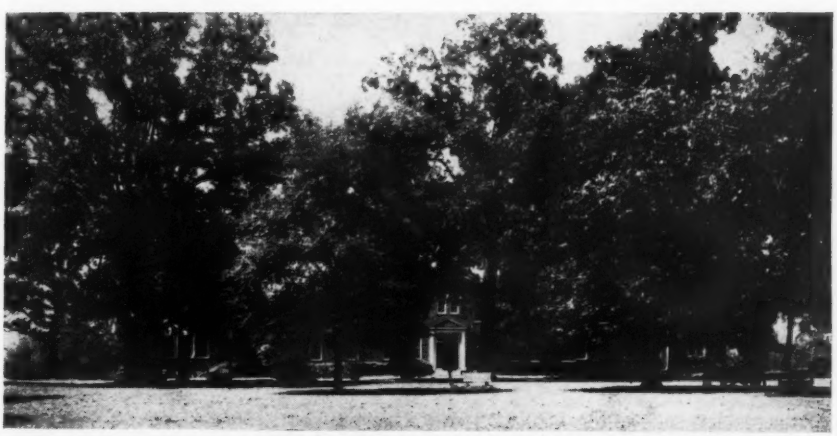

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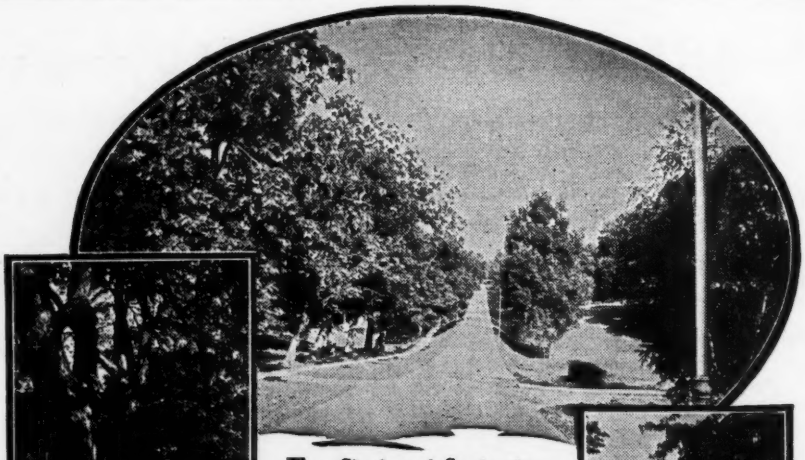

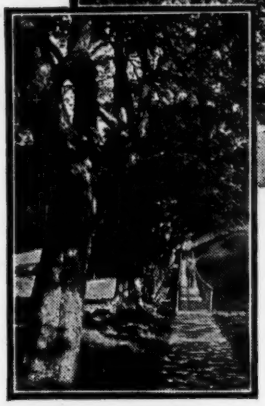

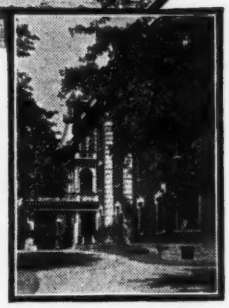

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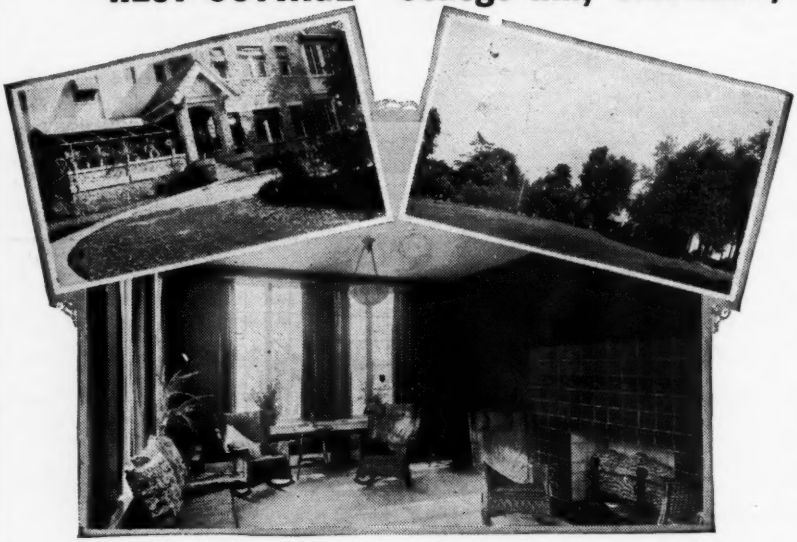

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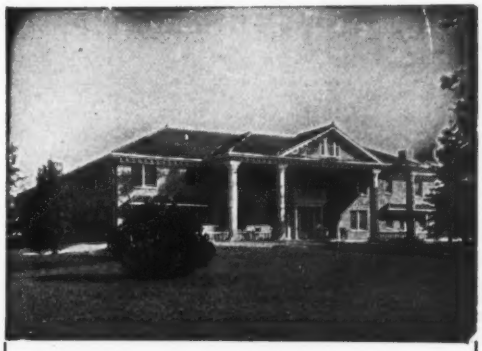

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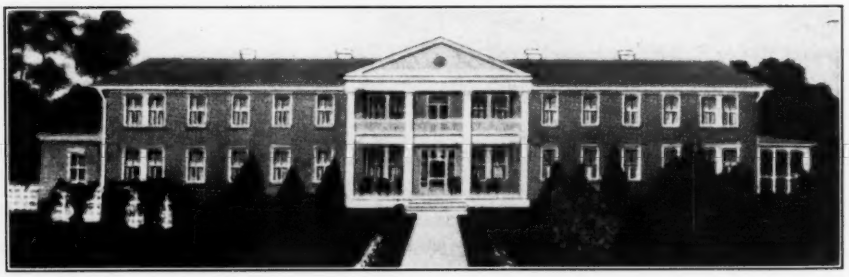

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THE TREATMENT OF HEMANGIOMATA BY EXCISION*

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and
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Baltimore, Maryland

The hemangiomata which are on or near the surface of the body are naturally those which appear most important to the patient, and it is this group, with the exception of "port wine marks," with which we will principally concern ourselves in this paper.

These tumors may involve the skin or mucous membrane alone, or the skin and varying depths of the underlying soft parts, or the soft parts under the skin down to the deep fascia. Trauma is said to be an etiological factor in producing hemangiomata, but our belief is that where there is a definite history of trauma, the tumor is not caused primarily by the injury, but the injury probably stimulated a latent growth which was already present.

Some of the tumors are made up of a new growth of dilated capillaries, usually with the involvement of the small veins and arteries, which for purposes of identification may be called simple hemangiomata; others are made up of large anastomosing blood spaces which are enclosed by thin septa and which are known as cavernous hemangiomata.

Hemangiomata are quite common and may be either circumscribed or diffuse. They may be single or multiple and sometimes they are encapsulated. They may be present at birth or may appear at any time. They may remain stationary and then suddenly begin to grow rapidly, or the increase in size may be quite rapid from the beginning. No region escapes, but the tumors seem to be found more frequently in those parts which in embryonal life correspond to the fissures. They may originate in the skin, or anywhere under the skin, or in any organ or tissue except the hair and nails. They may involve either the skin alone, or the subcutaneous tissues alone, or the skin and subcutaneous and also deeper tissues, even including muscle and bone. They may be completely or partly compressible and completely or partly pulsatile. Hemangiomata vary in size from pinhead growths to those involving a whole limb or organ. The tumors receive their blood supply from arteries and convey it to veins.

Thrombosis may occur in the dilated blood spaces of cavernous hemangiomata and calcific phleboliths may be formed. Sometimes in the deeper seated hemangiomata the presence of these phleboliths, disclosed by roentgenograms, confirms the diagnosis.

Some of the tumors project markedly above the adjacent normal skin level and are of considerable size; others have a comparatively small area visible on the skin surface and mushroom out under the skin quite extensively; others involve the skin much more extensively than the subcutaneous tissue; others can be seen through the skin as a bluish mass involving the tissues under the skin and not the corium itself.

These tumors, when in the skin, are usually brilliant or deep red in color, which color often changes to purplish red on exertion or congestion. The surface color may be uniform throughout, or may be mottled, and the surface projecting above the skin may be smooth or may be uneven and lobulated. In the deeper tissues, the color often cannot be seen until exploration is carried out, and then it will usually be a much deeper red than the tissue in which it is found.

Doubtless all of you have at one time or another been asked the best method of dealing with these hemangiomata, especially those on the face

*Read in Section on Surgery, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

and other exposed portions of the body, and sometimes it is not an easy decision to make.

In a very interesting paper by E. F. Traub, the question as to whether hemangiomata should be treated at all was discussed. He endeavored to find out whether, in many instances, these tumors would spontaneously disappear if left alone. His conclusions based upon his own experience and on the experience of a number of dermatologists with whom he communicated in regard to the types of tumors with which we are dealing, are summarized in his own words as follows:

"Hemangiomata and cavernous hemangiomata have been definitely observed to disappear spontaneously in a number of cases, the latter much more rarely, however, than the former.

"This happens with such relative infrequency that it seems advisable to commence the treatment of the child during the first year of life, not delaying longer than the third year, and this only in the event that the lesion is stationary and does not increase in size.

"Hemangiomata and cavernous angiomata are in most instances best treated by careful and conservative application of radium. In a few selected cases either surgery or carbon dioxide snow may be the treatment of choice."

Our strong conviction on this question is that simple hemangiomata and cavernous hemangiomata should all be treated, whatever the method chosen, unless there are definite signs of retrogression, and the earlier the treatment is begun the better. While some of them may occasionally disappear spontaneously, the history of many is that of rapid growth, and we have seen disastrous consequences in the way of excessive spread follow procrastination in treatment.

If simple hemangiomata and cavernous hemangiomata are not treated, what may be the result? In some instances, in our experience rare, they disappear spontaneously. The growths may increase in size to such an extent as to be unsightly and also in certain locations they may cause interference with function. Pain, which incapacitates, may be an important factor, especially in deep seated tumors. Where the growth is on the surface, injury may cause hemorrhage, and in those instances in which the walls are thin, severe spontaneous hemorrhage may occur. Ulceration is not infrequently found in the elevated type. It is, of course, safe to keep under observation a tumor which is not growing and which for some reason it is inconvenient, for the time being, to have treated, but the sooner the treatment is begun, the better for the patient.

METHODS OF TREATMENT

The object of all methods of treatment is either the removal or the obliteration of the vascular channels making up the tumor. Where excision is inadvisable, this obliteration is accomplished by converting the vascular mass into scar tissue by one method or another.

It is probable that one of the earliest methods of treating hemangiomata which were in the skin or close to it was by excision, so it should be understood that this report brings forth nothing new, but its purpose is to call attention to this positive treatment, which in the last thirty years has been largely superseded by other methods. As a matter of fact, during this period the treatment by excision has in many clinics been completely neglected, and these cases have been referred to the dermatologists and not to the surgeons.

Some of the methods used in the treatment of hemangiomata are as follows: carbon dioxide ice; electro-desiccation; electro-coagulation; diathermy; implantation of magnesium darts; subcutaneous spiral or interlocking sutures; injection of sclerosing solutions; radium and x-radiation; and excision. It may be advisble to say a few words on the more important of these methods, but no attempt will be made here to consider the various technics in detail or to review the voluminous literature.

Carbon Dioxide Ice.—In some instances where the tumor is in the skin alone and is small, and does not involve the subcutaneous tissue, especially where it projects above the skin, the use of carbon dioxide ice is effective. It is seldom that a single treatment is sufficient and two or three treatments, or even more, may be necessary. In spite of the greatest care, the result in successful cases will be a whitish scar somewhat larger in extent than the original growth, which may be slightly depressed. Much the same can be said of the result of desiccation. There are certain patients, however, who prefer these local treatments to any operative or more radical methods, although the process may be long drawn out and may be quite painful unless a local anesthetic is used.

Sclerosing Solutions.—Among the sclerosing solutions used is boiling water, which was introduced by Wyeth. Later Francis Reder published a splendid monograph in which he strongly advocated the method and reported excellent results. Perchloride of iron in various strengths was one of the earliest solutions injected and a number of fatalities were reported.

Morestin, after tieing off the vessels supplying the growth, injected a mixture of one-third 90 per cent alcohol, one-third glycerin and one-third formaldehyde, and reported satisfactory results. Quinine and urea 33 to 50 per cent have also been used.

Since sclerosing solutions of various kinds have become popular in the chemical obliteration of varicose veins, a new impetus has been given to the treatment of hemangiomata with one or the other of these solutions.

We have seen pulmonary emboli caused by the injection of boiling water and other sclerosing solutions. Then again we have seen large sloughs follow such injections. These untoward happenings may have been caused by faulty technic, although those which we have observed followed injections by experienced and careful men. The method, whatever solution is used, is not without danger, and gangrene, slough and even death may follow treatment by injection. This fact must be borne in mind.

Radium and X-radiation.—Probably the most popular treatment of hemangiomata at present is with radium. Excellent results may be obtained by its use, but in more than a few instances there follow ray changes in the skin and sometimes in the deeper tissues with all the unpleasant consequences of a radium burn. There is also another danger in the use of radium in the treatment of hemangiomata and one to which apparently little attention has been given. There may be either a checking of development of the part treated and also of the adjacent tissue in growing children, or there may be atrophy of underlying and surrounding structures in older individuals. In other words, uninvolved parts may be affected by the radiation. These tumors are often found in young children. They are also often found over fontaneles and in positions under which are important organs such as the eye. We do not feel sure of the safety of these underlying structures after radiation. The remarks just made concerning radium apply equally to x-radiation.

We should like to reiterate again that if radium or x-radiation is employed for the treatment of hemangiomata, these rays should be used only by an expert and even then with the utmost care, as both radium and roentgen rays are dangerous therapeutic agents in other hands.

We have not treated hemangiomata with diathermy, nor have we seen the results of such treatment, but the method has been very favorably spoken of and should be useful in a certain group of cases.

The actual cautery has been frequently used to destroy angiomatous tissue, as has electrocoagulation, but there are obvious disadvantages in both of these measures, among which bad scarring may be mentioned.

Sometimes the blood channels can be cut off and scar tissue produced by the use of spiral or interlocking subcutaneous sutures, which pass in and out through the body of the tumor and are tied tightly to cut off the vessels and induce scar. This method was advocated by Beck and others and may be very useful in preparing certain tumors for subsequent operative work. Payr reported excellent results following the implantation of magnesium darts, but we have had no experience with this method and have not seen any cases thus treated.

Operative Methods.—Unless an emergency condition arises, we always attempt to have the patient in as good physical condition as possible with hemoglobin of at least 75 per cent. The clotting time should also be noted and measures taken to shorten it if it is over six minutes. It is advisable in extensive cases where the growth cannot be removed at one operation and where angiomatous tissue has to be cut through, to have the patient's blood matched, in case the necessity of transfusion should arise.

Anesthesia.—Some of these growths can be excised under local anesthesia, usually by the block method, but our preference in the majority of instances is for a general anesthetic, selected for the needs of the individual case.

The skin is prepared as for any other clean operation. There are two methods of proceeding with the operative treatment: (1) complete excision; (2) gradual partial excision with closure. Complete excision is indicated when the growth is small enough, or is in a situation where there is sufficient lax tissue to close the wound immediately after removal of the tumor.

Gradual partial excision with closure is indicated when the growth cannot be entirely removed at one operation and the wound closed immediately, either because the tumor is too large or because it is in a situation without lax tissue.

Complete Excision.—The area to be excised is marked out in the shape of an elongated ellipse with brilliant green, 5 per cent in alcohol. The ellipse, which includes the tumor and a certain amount of normal skin, is laid down in the direc-

Fig. 1

Illustrating the elevated type of hemangioma. Child five months old. At birth there was a tiny flat, reddish mark visible on the shoulder. When the patient was two months old rapid increase in size was observed and this has continued. Note the size of the tumor. There is an area of superficial ulceration over two-thirds of its surface. The tumor projects 2 cm. above the surrounding skin, and it can be seen to involve the subcutaneous tissue over a larger area than the superficial growth would indicate.

Left: Before operation.

The right view shows the scar three weeks after complete incision. The growth extended down to and involved the deep fascia. The position of the arm tends to roll the tissues up and make the scar seem more prominent than it actually is.

tion most advantageous to closure and cross marks are made to facilitate rapid suturing by indicating the points which should be approximated. The ellipse should be planned so that the closed wound will be as short as possible.

Some of these tumors may be removed surgically without any more precautions as to hemorrhage than would be taken in the excision of any growth of similar size, but as a rule we take certain measures to prevent or control possible hemorrhage. If the tumor is on an extremity the cuff of a blood pressure apparatus, or a carefully applied tourniquet, should be used to control the bleeding. In addition to the tourniquet, or in those instances where a tourniquet cannot be used, a loop of flexible lead wire about three or four millimeters in diameter is placed on the skin so that it completely surrounds the tumor, but far enough away from it not to interfere with the operator. This wire is pressed down into the skin firmly by an assistant, and should be kept tightly pressed down until the wound is ready to be closed. By the use of this most useful maneuver the bleeding can ordinarily be well controlled. After the tourniquet, or the lead wire loop, or both, are in place, the incisions are made with an ordinary scalpel down through the skin and subcutaneous tissue as deeply as necessary, and the entire mass is removed.

If the tumor can be excised at one operation, care should be taken that every particle of angiomatous tissue be removed. Angiomatous tissue can be easily recognized, as it is a much deeper red in color than is normal tissue, and also its vascularity is greater.

Gradual Partial Excision.—Where the growth is too large to be excised at one operation and gradual partial excision is decided upon, an ellipse is marked out, as previously described, which includes as much of the tumor as possible, but not enough to interfere with immediate closure of the wound with sutures. In some instances, the ellipse is marked out entirely in tumor tissue. The lead wire and tourniquet are applied and the incisions, made with the cautery knife, pass through angiomatous tissue, but, as a rule, there is comparatively little difficulty in dealing with the bleeding if everything is prepared in advance. However, much trouble may be encountered if the operator has neglected to take proper precautions. Sometimes bleeding may be quite profuse in positions where the wire loop pressure cannot be satisfactorily applied, or where the tourniquet is ineffective, and where such a contingency may be expected, before the operation is begun interlocking sutures of some sort may be placed, or the tissues adjacent to the tumor may be transfixed by several long steel pins over which elastic ligatures are tightly laced. In certain instances it is advisable to tie off in advance arteries supplying the region occupied by the tumor. Sometimes the afferent vessel to the growth can be found and tied at the beginning of the operation.

There is little use in trying to check the bleeding, which has not been controlled by the measures mentioned, in the spongelike cavernous tissue by clamping, unless an afferent vessel may be found. In such instances over and over catgut whip sutures, including masses of the tissue,

drawn up tightly, are helpful, and also deep through and through skin sutures may sometimes be necessary.

Ordinarily the wounds in both complete excision and in gradual partial excision are closed in layers with buried sutures of catgut or waxed silk for the deeper tissues and on-end mattress sutures of horsehair and waxed silk for the skin. Where a considerable amount of tissue has been removed some undercutting may be necessary before closure can be easily done.

The sutured wounds, after both complete and partial excision, are dressed with a single thickness of gauze which has been impregnated with 3 per cent xeroform ointment and over this is placed a sterile moist seasponge held snugly in position with adhesive plaster and a bandage. We have never had any difficulty with postoperative hemorrhage. The stitches are usually left in for fully ten days, except on the face, as there is always a certain amount of tension, due to the excision of the ellipse of tissue. On the face, in order to avoid cross marks, we begin the removal of stitches on the second day, splinting the area from which each stitch has been removed with a strip of crepe lisse placed across the sutured wound and fastened to the skin with collodion.

After healing is complete, in order to allow the surrounding tissues to stretch, at least two months should elapse before the second excision is attempted. This is carried out in exactly the same manner and the procedure is continued with the same time intervals until the growth is completely removed. During the intervals massage is very helpful in stretching the skin.

SUMMARY OF 200 CASES

We have studied the records of 200 cases in which hemangiomata have been treated by excision, as we felt that a review of this number of cases was sufficient to give the desired data. One hundred of these cases were operated upon by one of us and the other hundred by other surgeons at the Johns Hopkins Hospital and at the Union Memorial Hospital.

In this group of cases, hemangiomata were found to be more prevalent in females, 128, than in males, 72. One hundred and ninety were in whites and 10 in negroes. The ages of the patients varied from a few weeks to 70 years. The age of onset was as follows: up to 1 year, 139; 1 to 10 years, 17; 10 to 20 years, 12; 20 to 30 years, 7; 30 to 40 years, 1 case; 40 to 50 years, 1 case; 50 to 60 years, 1 case; 60 to 70 years, 3 cases; age of onset undetermined, 19 cases. The tumors were single in 170 cases and multiple in 30 cases.

The location of the 170 single tumors was as follows: head, which includes the scalp, forehead, face, nose, lips and mouth, 93 cases; the neck, 12 cases; the upper trunk, 17 cases; the lower trunk, 10 cases; the upper extremity, 21 cases; the lower extremity, 13 cases; the genitalia, 4 cases. In the 30 cases of multiple tumors, there were varying locations, and the number of tumors found in a single case was from 2 to 5.

In this group the family history was unimportant. There was nothing of special interest in the nationality groups. In all those instances in which the Wassermann test was done, the result was negative. More than half the patients, 139, gave a history of the development of the tumor during their first year and this group may be called congenital, as the tumor probably was present at birth in each one of these cases. In this group, there is often a history of very rapid growth. We unquestionably see more of these tumors in young children and the cases in the decade groups up to 30 years gradually lessen. There are 17 cases from 1 to 10; 12 cases from 10 to 20; and 7 cases from 20 to 30.

A number of these cases had been treated by radium or x-radiation, or by sclerosing injections or by other methods before coming under our care. There is a history of trauma before the development of the tumor in 6 cases, but we are inclined to believe the latent tumor was already present and that the injury only stimulated growth.

Complete excision was done in 154 cases and partial excision in 46 cases. In practically all of the complete excisions the result was good. In the incomplete group where final excision had not yet been finished, there was always improvement.

COMMENTS

We do not believe that every vascular growth of the types considered in this report should be treated by excision as a matter of routine, but feel that the method of treatment should be selected which promises the best result for the particular individual.

The custom has arisen in many clinics of using radium or x-radiation in every case. This point of view is as incorrect as the belief that every hemangioma should be treated by excision

or by any other single method. It has been stated by a number of authors that the treatment of hemangioma is never a surgical problem. We do not agree with this as a general proposition, but realize that now and then hemangiomata are found in situations which cannot safely be treated primarily by excision, as for example in extensive involvement of the floor of the mouth; of the parotid region; and of the tongue. In these cases, radiation or sclerosing injections, or both methods may be used, and in some instances we have followed such treatments by secondary excision.

For instance: sclerosing solutions, followed by radium or x-radiation; sclerosing solutions followed by excision; partial excision followed by carbon dioxide ice; radium or x-radiation followed by excision; partial excision by radium; subcutaneous spiral sutures followed by excision; and other combinations.

It is not our intention to minimize the value of radiation or to object to the use of sclerosing solutions and other methods in suitable cases, as we have seen excellent results follow treatment with these methods. We have also seen a few hemangiomata which have apparently been stimulated to more rapid growth after radium or x-radiation has been used.

In many instances following the successful treatment of hemangiomata, which project above the skin or involve the thickness of the skin, with radiation or with sclerosing solutions, there is a marked flat or depressed wrinkled scar which does not match the surrounding skin and is very objectionable to the patient. This scar may be removed either by complete excision, if suitably located, or may eventually be eliminated by gradual partial excision with closure. Should either sloughs or burns occur, the same process can be used after healing is complete and the scar has been softened and loosened by massage. In such cases the question arises as to whether it would not have been advisable to use excision as the primary treatment.

It may be necessary in certain cases to completely excise a hemangioma and skin graft or shift a pedunculated flap to cover the defect, but this in our hands is not a usual procedure in dealing with the hemangiomata considered in this report. It is seldom that we cannot improve conditions sufficiently either by complete excision or by gradual partial excision with closure.

We feel quite sure that the fear of hemorrhage has been a factor in the abandonment of operative methods. The danger of hemorrhage can be minimized by the use of the tourniquet, the lead wire and other maneuvers. Infection is no more frequent than in any other clean operative procedure.

We have not hesitated to cut through angiomatous tissues in those instances where complete excision could not be done, and except for occasional free bleeding have not seen any bad results follow, such as increase in size, embolism or gangrene. As a matter of fact, in many instances after the first step in gradual partial excision, there has been a marked shrinkage of the portion of the hemangiomata which has not been yet removed. This is undoubtedly due to the obliteration of some of the vascular channels by scar tissue formation.

In extensive "port wine marks," especially in locations where the skin is lax, considerable improvement can be made by diminishing the size by gradual partial excision. We feel that in many instances, the treatment of hemangiomata by excision is the method of choice, and that the value of this method has been largely lost sight of.

We have used excision in the treatment of suitable hemangiomata for many years and have found it positive, effective and safe. There is little if any danger of recurrence if the excision is thoroughly done.

We are confident that the treatment of hemangiomata by excision is safer for the patient in the hands of a surgeon with a reasonable amount of skill and experience than is the treatment of these tumors by radium or x-radiation unless in the hands of an expert. In a number of instances we have seen burns and in addition atrophy and a check of development of bone and adjacent tissues following radiation. This same statement as to safety may also be made about the injection method, as we have seen pulmonary emboli and extensive sloughs follow injection of sclerosing solutions.

The result of excision of hemangiomata is usually a fairly narrow scar which may spread somewhat if a considerable amount of tissue has been removed. Should this occur, the scar can be excised after the tissues have stretched and an inconspicuous line scar will be the final result.

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DISCUSSION (*Abstract*)

Dr. John S. Horsley, Jr., Richmond, Va.—Surgical excision is undoubtedly the best method of treatment of hemangiomata in the majority of cases. I should like to emphasize my agreement with Dr. Davis' opinions by briefly reporting two cases.

A baby boy, 3½ months old, was brought to me with a rapidly growing hemangioma involving the outer two-thirds of the lower right eyelid and a portion of the cheek. A few days after birth a minute "red spot" had been noticed. When the parents first called the family physician's attention to this, he stated that it was only a small birthmark and need give them no concern. No treatment had been given before I saw the baby. Under general anesthesia (rectal avertin supplemented by ether inhalation) the tumor was completely excised, the incisions running parallel to Langer's lines of tension. The wound margins were undermined sufficiently to permit a transverse closure without tension on the lid. Microscopic examination of the specimen revealed a hemangio-sarcoma. The little patient had a smooth convalescence and was discharged from the hospital six days after operation. On account of the malignant nature of the tumor, x-ray therapy was also given. After nearly four years (three years and nine months) there has been no recurrence, no deformity of the eyelids, and no disturbance of the eye. The resulting scar is inconspicuous.

The second case is a fifteen-year-old girl who came to me with a foul, ulcerated hemangioma of the lower lip and chin. It was unfortunate that the seriousness of the hemangioma, present at birth in a very mild and easily controllable state, had not been recognized earlier. In addition to the ulcerated and infected hemangioma, there was definite evidence of burns from radium and x-ray radiation, caustics, and so on. Under local anesthesia, the entire lower lip and part of the chin were excised well down over the mandible. Lateral flaps from the cheeks were then fashioned and the chin and lower lip reconstructed. The patient made a satisfactory convalescence from the operation. The results were not complete, however, because the defect left after removal of the lower lip and portion of the chin was so great that a complete reconstruction could not be done at one stage. She was discharged from the hospital about two weeks from the time of this first operation and reported again in two months for further reconstructive work on the lower lip. On the second admission the lip had healed satisfactorily and the inflammation had entirely subsided. The artificial mucocutaneous line and mucous membrane of the lower lip were in excellent condition and in good apposition. The lip sagged in a curved manner in the central part. The sagging was about 1 cm. more than normal at its lowest point. A plastic operation was performed along the line of Hunt's modification of Blasius' method, shifting lateral flaps up to fill in the curved defect. The patient was discharged ten days after this operation with a satisfactory result. She has been carefully followed, and her condition six years after the last operation shows no further evidence of infection, no radiation burns and no return of the hemangioma.

Dr. James Barrett Brown, St. Louis, Mo.—The primary consideration in treatment of hemangiomas should be surgical excision, and other forms of treatment should be adopted only after the advisability of surgical excision has been rulel out. Because of the frequent delay in beginning treatment and because of the frequent tendency to consider anything but surgery in the treatment, Dr. Davis' paper is very timely. Much good will come from it if it be studied, especially by obstetricians and pediatricians, who are the first to see the small, apparently congenital beginnings of arterial growths that may rapidly destroy tissue.

In speaking of the necessity of early treatment, probably some distinction should be made between growths predominantly venous and the small bright red arterial hemangiomas. We have seen very small, strawberry-red growth, noted soon after birth, rapidly advance to wide destruction of tissue, and this, of course, is worse when it occurs on the face. At one time on our service we had a baby with complete destruction of the ear, one with almost complete destruction of the side of the face, and three others with widespread involvements of the nose, breast and vulva. The growths had destroyed all of these areas within the first few months of life after starting from small hemangiomas that might have been excised or removed with a cautery. We have never seen a bright red hemangioma disappear spontaneously, and it is possible that some hemangiomas reported as disappearing have been the mild bluish red blotches that occur around babies' faces and over the backs of their necks. Because we prefer to get rid of even very small spots of arterial hemangiomas as soon as they appear, we frequently employ the cautery for these local destructions; and for growths about the body and vulva we have used partial cautery excision and then made multiple cautery puncture holes through the outlying involved region in an effort to leave some skin behind, hoping to get obliteration of the remaining vessels by scarring (or inflammation).

In one case of large venous channels associated with hypertrophy of the bones of the leg and foot, we obtained successful obliteration with an interlocking suture of catgut, placed directly through the skin and through the vessels. This might be a safer method of sclerosis of these large channels than the injection of solutions.

In excising hemangiomas it is important to obtain the supplying vessels and to ligate them as deeply as possible. For growths of moderate size about the body, one or two supplying arteries are usually found quite deep, and, if recurrence occurs, it is apt to originate from these points. On the scalp the supplying arteries come in laterally.

We have obtained some alleviation of the disfigurement of port wine stains by excising the skin down to the lower layers of dermis and then applying free grafts.

Factors that may cause one to deviate from surgical excision or cautery destruction occasionally arise, such as position, size or wide spotty distribution of the growth, and preconceived ideas of treatment by the patient, parent or physician. For many of these, instead of surface radiation we prefer interstitial radiation in the form of gold radon seed and have had some very favorable results about the ears, eyelids and face. However, radiation therapy is slow in action, there may be much more discomfort than with excision, and the resulting scar may require as much surgery as the excision of the original lesion. The possible bad effect of radiation on neighboring tissues, mentioned by Dr. Davis, is also worthy of consideration in view of Dr. Brooks' findings of a definite diminution of bone growth from exposure to x-rays. Further, actual radiation burns are not so infrequent as might be thought; in a series of 97 radiation burns on Dr. Blair's service 11 resulted from treatment for hemangiomas. In one patient there was loss of vision of one eye and in another there was so much damage about the orbit that vision was markedly impaired.

Dr. John E. Cannaday, Charleston, W. Va.—In this class of work the results obtained by the use of radium are rather poor. The skin is disfigured too much, especially if the location is on the face. In some cases I have attained reasonably successful restults by the injection of boiling water. This method has been used successfully in a number of cases by such well known members of our profession as Dr. Francis Reder, of St. Louis, and Dr. Irvin Abell, of Louisville.

I quite agree with Dr. Davis that the excision method has a number of advantages, particularly with reference to the conservation of tissue and the elimination and prevention of deformity.

RADIATION THERAPY OF RENAL CORTICAL NEOPLASMS*

WITH SPECIAL REFERENCE TO PREOPERATIVE IRRADIATION

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Our attention was first directed to the radiosensitivity of cortical renal tumors by the response to irradiation in the following case: the patient, a man, aged 52, was admitted to the Brady Urological Institute April 10, 1923, complaining of pain of eight weeks' duration in the left kidney region. There was a visible, palpable mass to the left of the midline, projecting beneath the costal margin, which moved with respiration. It was firm, nodular, irregular and extended 11 cm. below the border of the ribs. The late Dr. J. T. Geraghty's note stated: "The pyelogram shows a typical picture of hypernephroma. The patient is referred for deep x-ray therapy. If the size of the mass is decreased by x-ray, nephrectomy may be advised at a later date. The mass at the present time is inoperable."

Within ten days the mass had decreased in size so that it was barely palpable beneath the costal margin. The patient returned to his home for a six weeks' rest, but did not return for operation. We have recently learned that the patient died in 1929, five and one-half years after irradiation. Operation was never carried out. Our results in preoperative treatment of cortical renal tumors are based on the study of eleven cases.

It is evident that in this case we were dealing with an extremely radiosensitive tumor. Its prompt response to radiation and its striking and phenomenal conversion from an inoperable to an operable tumor at once suggested the advisability of radiating preoperatively all tumors of this type, not alone with the idea of simplifying nephrectomy, but of devitalizing the tumor and thus minimizing the risk of metastasis.

Marked reduction in the size of the primary tumor has followed intensive irradiation in other cases in which nephrectomy was not indicated because of the size of the tumor or the presence of demonstrable metastasis. In these cases, however, death has always occurred within five and one-half years.

Further experience in the irradiation of cortical tumors has shown considerable variation in the rapidity and degree of regressive changes in different cases. It would seem that the desired result is dependent upon the selective action of the x-ray for certain cells, and particularly those cells which are undergoing rapid division or mitosis. Ewing has pointed out that tumors which revert to the embryonic type of growth and present a considerable degree of anaplasia are most radiosensitive. On the other hand, squamous cell tumors exhibit marked resistance to irradiation as do those derived from transitional epithelium. The refractory response to irradiation of the papillary tumors of the renal pelvis and bladder are thus accounted for.

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*From the Brady Urological Institute, The Johns Hopkins Hospital, Baltimore, Maryland.

An analysis of these cases makes very evident the fact that the percentage of cures will probably not be materially increased until earlier diagnosis makes possible the institution of treatment before metastasis has occurred. The importance of hematuria as the first symptom in the majority of cases cannot be too strongly emphasized and when present, either grossly or microscopically, should call for a thorough and exhaustive investigation of the urinary tract.

When the diagnosis of renal tumor is definitely established it is desirable, because of the selective action of the x-ray for certain types, to attempt a differentiation between the radiosensitive and radioresistant tumors. The great majority of the cortical tumors respond to irradiation and these cases should receive treatment preoperatively. For papillary tumors of the pelvis, because of their peculiar characteristics, a different therapy is indicated.

The immediate result of irradiation in radiosensitive cortical renal tumors is the remarkable reduction in the size of the tumors. In all cases the tumor has been reduced to less than half its original size. A certain amount of nausea and general malaise has accompanied this therapy, but with well regulated doses this may be kept at a minimum. The reduction in the size of the tumors begins very promptly, within two or three days, and continues for probably two to three weeks following the cessation of treatments. There will be, however, some cases requiring more radiation, depending upon the degree of radiosensitivity of the tumor, and in these cases a second series of irradiation should be given before operation.

However, it is our belief, at this writing, that the great majority of the radiosensitive tumors will be sufficiently shrunken and destroyed with the first series. In these cases the optimum time for operation is approximately three weeks following the irradiation. It has been shown in two cases, *5* and *6*, that the tumor may begin to grow after a prolonged rest period.

In six cases, the tumor was so large that operation would have been practically impossible at the time the patient first reported. The operators in these cases have not found operation any more difficult than in non-radiated cases.

It is, of course, essential that the tumor be removed with as little manipulation as possible to prevent pressing tumor cells into the blood stream. Preoperative irradiation has diminished the size of the tumor and allowed more freedom at operation. The operation should be planned so that the pedicle of the kidney may be ligated before freeing of the tumor, thereby preventing metastasis by way of the renal veins. Adequate exposure may be obtained in certain instances through a lateral rectus incision. In certain large tumors, as in the sixth case, where the tumor has recurred and was very large, a T-shaped incision allowed adequate exposure. A long S-shaped oblique abdominal incision similar to that used in the lumbar approach might be used in the transperitoneal approach.

In addition to remarkable reduction in the size of radiosensitive tumors, irradiation has produced decided changes in the tumor pathology. First, we have noted extensive fibrosis around the tumor with thickening of the capsule which would inhibit the expansion of the tumor. Second, we have noted sclerosis of the small blood vessels and capillaries which supply the tumor. This change is observed principally within and beneath the tumor capsule.

Necrosis is a common finding in large cortical tumors following irradiation. In one case (*6*) we observed a remarkable reduction in the size of the tumor mass after the first and second series of x-ray therapy. Later, after a period of rest, the tumor again grew. The gross pathological specimen shows a large central area of necrosis surrounded by a thick fibrous membrane, which in turn is surrounded by a zone of tumor showing none of the effects commonly produced by x-ray. It may be that the first radiation produced the central necrosis and a greatly thickened fibrous membrane, leaving a few living tumor cells to recommence the growth which so symmetrically surrounded the necrotic area.

Tumor tissue in adults has shown certain cellular alterations which may be due to irradiation. These findings are constant and consist of loss of cell outline, diminution in size of the nuclei, and loss of staining quality with hematoxylin. The latter quality varies, but has been noted before in tumors subjected to irradiation. A further microscopic change is in the more or less extensive deposition of hyaline material and marked fibrosis. Deposition of iron pigment is a fairly constant finding and occurs with the death of tissue.

One tumor, in a child of 3 years, showed a most remarkable reaction to irradiation. It decreased to one-twentieth its size after one series of x-ray. The pathological specimen showed very remarkable thickening of the tumor capsule. The tumor in gross resembled a hyperne-

phroma. The tissue appeared compressed and the tumor was very much firmer than the usual hypernephroma. Microscopically, there was most extensive fibrosis with hyalinization, necrosis and deposition of iron pigment. There was no tumor tissue that pathologists could recognize as viable. A few very tiny microscopic areas showed masses of clear, small cells, compressed between connective tissue fibers. These cells had clearly defined outlines and small dark nuclei without mitotic figures. There was no papillary or adenoid formation, but the type of cell described with the gross appearance of the tissue made the diagnosis of hypernephroma quite certain. None of the characteristics of Wilms' tumor was noted.

The last patient to receive preoperative irradiation was treated very intensively without reduction in gross size of his renal tumor. On gross examination the mid-pole cortical tumor presented a picture very similar to the other specimen. However, there were no areas of necrosis, no large cysts and no blood-filled spaces. On microscopic examination, the diagnosis of papillary carcinoma or malignant papillary cystadenoma was made. We are at a loss to explain the radioresistance of this tumor, but the case offers a remarkable contrast to the effect produced by irradiation of the so-called hypernephroma. It is well known that these carcinomata do not invade the blood vessels as early as hypernephroma, and metastases are late. The characteristic of the tumor is implantation and it is of great importance to remove these tumors without opening their capsules. It may be that we have in deep therapy a test whereby papillary carcinoma or cystadenoma may be differentiated from other cortical renal tumors of the hypernephroma type before operation.

It has further been noted that the renal tissue outside the tumor which received irradiation appears normal. The glomeruli and Bowman's capsules are intact. The tubular epithelium shows no hyalinization and no fatty degeneration. There is no interstitial fibrosis or thickening. The capillaries show a very slight degree of sclerosis, but with regulated x-ray dosage this has been kept at a minimum and pathologically we are unable to observe any gross or microscopic change in the secreting substance of the kidney indicative of nephritis.

The international "r" as adopted by the second International Congress of Radiology in Stockholm, Sweden, has been employed uniformly in the measurement of our dosage and 800 "r" has been used as our erythema skin dose. Daily doses averaging between 195 "r" to 345 "r," depending upon the degree of reaction, have been given. We have employed the saturation curves recommended by Weatherwax in the estimation of the loss of radiation effect in the tissues. Voltages of 200 kv. with 0.5 mm. copper and 2 mm. aluminum filters, 4 ma., at 50 cm. focal skin distance have been uniformly employed in our cases. Cross sectional charts of each case are made to estimate the location and depth of the tumor in order to arrive at an approximately correct tumor dose. Weatherwax has shown that with the above technic a 32 per cent loss in tissue effect is acquired in seven days. For the purposes of accuracy and simplicity, and because we believe it is possible to give a greater tumor dose with safety with this method, we have adopted it. The approximate length of time required to give a single series of treatment is three weeks. The question of nausea, the destructive effect on the blood cells and the infrequent occurrence of diarrhea all tend to influence the time factor. Each case necessarily will manifest individual characteristics and must be treated accordingly. *Fig. 1* illustrates the irradiation chart for *Case 5*. Eleven patients have received preoperative irradiation, seven of whom have come to operation. Careful clinical notes are available regarding the regression of these tumors following irradiation and the specimens removed at operation have been studied pathologically to determine the gross and microscopic changes produced.

We report in detail four cases which illustrate what may be accomplished by irradiation therapy.

Case 2.—R. M., aged 26, came to the Brady Urological Institute May 21, 1929, complaining of pain in the lower left quadrant of the abdomen, of about three weeks' duration, associated with intermittent hematuria, frequency and urgency of urination. A large soft mass was palpable in the left flank extending almost to the crest of the ilium, extending anteriorly and medially to the lateral border of the rectus muscle.

The phenolsulphonephthalein test showed appearance time 5 minutes and an output in one-half hour of 55 per cent. The left pyelo-ureterogram showed great deformity of the pelvis and calices, with marked elongation of the kidney. There was marked cupping of the calices suggestive of polycystic kidney. The ureter was dilated and displaced medially over the lateral portion of the lumbar vertebrae.

Between July 21 and September 18 the patient received a total tumor dose of 4243 "r."

He was readmitted to the hospital October 1, 1929, with slight nausea and a feeling of dullness in the

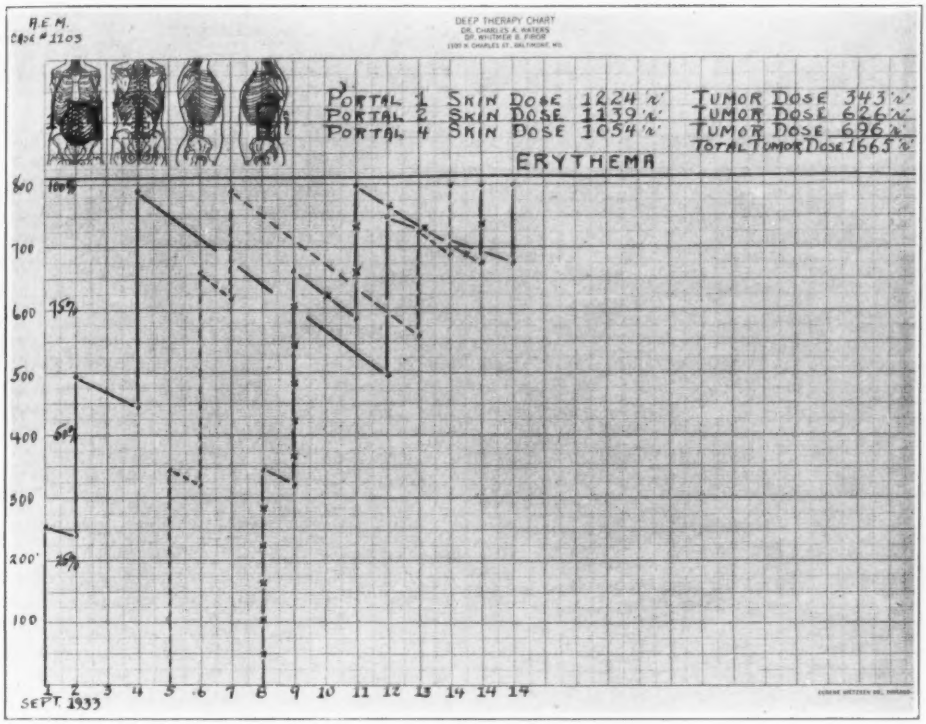

Fig. 1

Case 5. Roentgen chart showing the amount of irradiation given this case with complete regression of the tumor as far as palpation is concerned.

right flank. He had had no more hematuria. The tumor mass had decreased in size so that the tumor was barely palpable beneath the costal margin. The series of pyelo-ureterograms, *Figs. 2* and *3*, very beautifully demonstrates the diminution in the size of the tumor. The differential phenolsulphonephthalein test showed appearance time on the right of 3 minutes, the half hour collection being 51 per cent; appearance time on the left side was 15 minutes, with a half hour output of 7 per cent.

Nephrectomy, left, was carried out October 14, 1929. Lumbar extraperitoneal nephrectomy was accomplished without difficulty. The tumor was very adherent at the kidney pedicle and at the diaphragm. Pedicle clamps were left in place and removed 9 days after operation.

Pathology (*7336*).—The specimen is a left kidney, presenting a large upper pole tumor 9x8x11 cm. The tumor is covered by renal capsule which is adherent and infiltrated with tumor. The tumor is yellow with red hemorrhagic areas and large areas of necrosis. The kidney pelvis has been compressed downward, but there is no direct involvement of it. The upper and middle calices are distorted and compressed by the tumor. There is some dilatation of the lower pole calices.

Microscopic sections do not stain well with hematoxylin. The tumor is made up of large opaque cells with indefinite cell outline and with very tiny pyknotic darkly staining nuclei. There is much hemorrhage between the cells and in the large tissue spaces. There is much hyalinization and fibrous change. Mitotic figures are very prominent and in a section from the mid portion of the kidney we see invasion of the renal tubules with large clear foam cells in papillary formation. The x-ray has produced definite fibrosis within the tumor, shrinkage of the cells and possibly caused necrosis, although necrosis is frequently seen in large cortical renal tumors without radiation. There is apparently new growth involving the mid portion of the kidney. The diagnosis is hypernephroma with changes due to irradiation.

The patient was discharged one month after operation in good condition. He received 1017 "r" over the site of the tumor between January 8 and February 4, 1930. In February, 1930, x-ray of the chest showed definite areas of metastasis, which were treated by x-ray. In June, 1930, 1068 "r" were given over the site of the tumor and reexamination of the chest showed no evidence of recurrent metastasis. The patient died one year after operation of generalized metastasis.

Fig. 2

Case 2. Left retrograde pyelogram showing tremendous involvement of the entire kidney before irradiation.

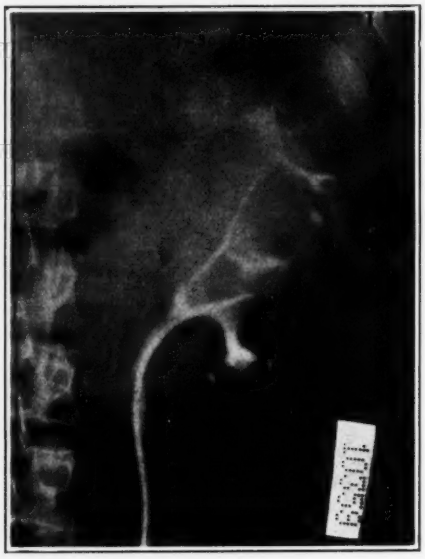

Fig. 3

Case 2. Pyelogram after tumor received 2512 "r" units. Note the definite reduction in the size of the tumor and the marked improvement in the filling of the pelvis and calices.

Case 4.—C. S., a colored child, aged 4 years, was referred by Dr. Lawson Wilkins October 20, 1933, and admitted to the Provident Hospital with an enormous mass in the right side which filled three-fourths of the abdomen. The tumor extended across the midline to the left half of the abdomen as far as the lateral border of the left rectus muscle and downward behind the crest of the ilium. The intravenous urograph showed a kidney displaced towards the midline, with marked compression of the calices and pelvis, indicating a large cortical tumor. The patient was emaciated, anemic, the red blood cells numbered 3,650,000, and hemoglobin 60 per cent. A transfusion of blood was given and the patient was referred for deep x-ray therapy, a tumor dose of 1397 "r" being given between July 5 and July 20, 1933. During this period the abdominal tumor disappeared and could be palpated as a mass only the size of a hen's egg at the lower pole of the right kidney. Hemoglobin on August 10 had dropped to 48 per cent and the red cell count was 3,800,000. Further transfusions were given and a second series of irradiation was undertaken in September, during which time a tumor dose of 1336 "r" was given.

Transperitoneal nephrectomy, right, was carried out by Dr. Lawrence Wharton October 12, 1933, through a right rectus incision. The intestines were packed off and the pedicle ligated before any operative procedure upon the kidney or tumor was undertaken. The kidney was removed separately from the tumor, after excision of the renal capsule. The tumor with renal capsule was then removed in one piece.

Pathology.—The specimen consists of a right kidney with the large tumor covering its posterior surface. The kidney measures 9.5x4.5x2.5 cm. and the tumor 9.5x5.5x2 cm. The kidney had been completely decapsulated and was removed separately from the tumor. Apparently the tumor lies within the true renal capsule. The kidney tissue on the surface appears to be normal. There is posterior compression of the renal substance and the cortex of the kidney is very thin. The tumor itself is well encapsulated and there is no involvement of the renal pelvis or calices. The tumor is firm, slightly less dense than normal kidney tissue. The capsule varies from 1 to 2 mm. in thickness, is white and glistening. The tumor is composed of large islands of yellow tissue with small areas of hemorrhage. One of these islands lies beneath the capsule at the upper pole and is separately encapsulated. The center of this area is necrotic and immediately beneath the capsule there is an extensive deposit of iron pigment. There is a great deal of fibrosis throughout the tumor and the tissue appears to be contracted.

Microscopic sections show a very thick fibrous capsule around the tumor. There is much necrosis, extensive hyalinization and extensive deposit of iron pigment between the fibrous tissue cells. The tumor cells are rather small and appear to be dehydrated. Many nuclei are seen at the periphery of the cells, which are indefinitely outlined. (There are a few islands of cells in this specimen that show definitely the structure of the original tumor. They are made up of large clear cells with very small darkly staining nuclei, fairly typical of hypernephroma.) There is no papillary or adenoid formation. Study of the kidney tissue outside the tumor shows normal glomeruli. The tubules are

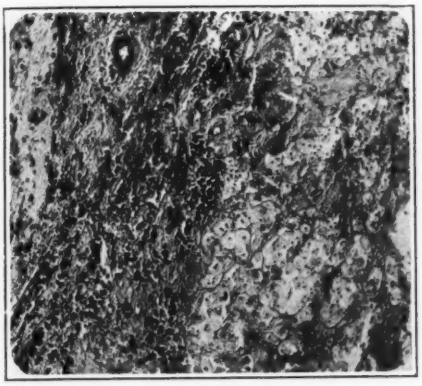

Fig. 4

Case 4, Path. 8847. Photomicrograph showing a nest of large opaque tumor cells with their tiny nuclei surrounded by a fibrous zone in which there is an accumulation of leucocytes and extensive deposition of iron pigment. Most of tumor destroyed by irradiation.

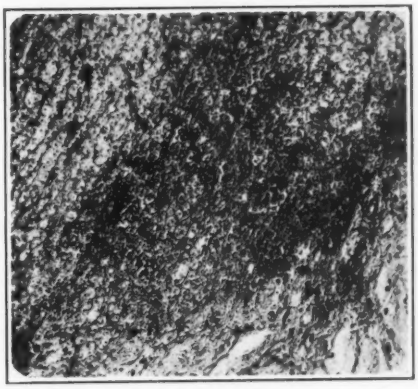

Fig. 5

Case 4, Path. 8847. Photomicrograph showing contracted tumor cells with increased amount of fibrous tissue, deposition of iron pigment and shrinkage due to irradiation.

normal. There are no casts. Near the pelvis there is some interstitial round cell infiltration (*Figs. 4* and *5*).

The diagnosis is hypernephroma. The tumor is practically totally destroyed by irradiation.

The patient's convalescence was uneventful.

Case 5.—A. E. M., a young woman, aged 15, was admitted to the Church Home and Infirmary August 25, 1933, because of hematuria, which had been intermittent for one year. There was marked loss of weight and the patient had felt some fullness in the left side of the abdomen for six months. Her family physician stated that the left-sided abdominal tumor was barely palpable two months before admission to the hospital. A hard, irregular nodular mass was palpable in the left kidney region, extending to the midline of the abdomen at the umbilicus and downward as far as the crest of the ilium (*Fig. 6*).

On cystoscopy, bloody urine was obtained from the left kidney. The pyeloureterogram shows deformity of the median portion of the kidney pelvis with displacement of the middle calices. The patient received 1665 "r" (see *Fig. 1*) and in 11 days the tumor had decreased in size so that it was barely palpable beneath the costal margin (*Fig. 6*). A differential phenolsulphonephthalein showed, on the right side, appearance in 5 minutes, and half hour collection 25 per cent; on the left side, the appearance time was 14 minutes, and half hour collection 8 per cent.

Pyelograms before and after preoperative irradiation (*Figs. 7* and *8*) show the very marked shrinkage of the tumor by irradiation.

Following irradiation the patient's red blood cells were 4,050,000, white blood cells 12,300, and hemoglobin 74 per cent.

Operation was advised following the decrease in the size of the tumor by x-ray treatment, but the parents refused. The tumor began to increase in size early in November, two months after irradiation, so that the family finally consented to operation, which was carried out November 27, 1933.

Operation was performed by Dr. Lawrence Wharton.

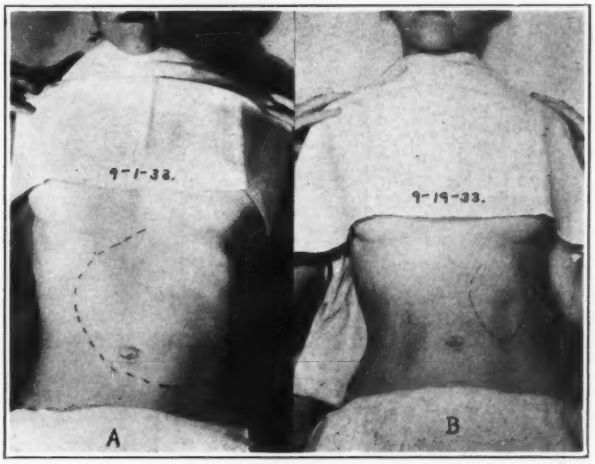

Fig. 6

Case 5. Dotted lines indicate size of tumor. A. Before irradiation. B. Nineteen days later. Note marked reduction in size of tumor. Tumor dose, 1665 "r" units. Forty-eight days after institution of irradiation no mass could be felt, but intravenous urogram still shows evidence of a mass in the upper pole of the kidney as shown in Fig. 8.

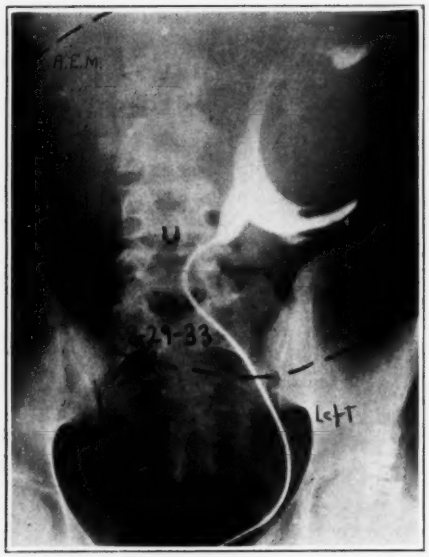

Fig. 7

Case 5. Retrograde pyelogram of the left kidney showing a typical mid-pole cortical tumor before irradiation. The dotted line shows the relative position of the kidney as noted on palpation.

Fig. 8

Case 5. Intravenous urogram showing marked regression of the lower part of the tumor. The pelvis has returned to its relative normal position, although there is still evidence of a mass involving the upper pole.

The abdomen was opened through a long left rectus incision. The lateral peritoneal attachment of the descending colon and splenic flexure was divided and the intestines were retracted medially. The pedicle was exposed and ligated before the tumor was approached. There were several aberrant vessels to the tumor which were clamped and ligated. The suprarenal gland was adherent at the upper pole and was removed with the tumor. Eight cm. of ureter were also removed. The posterior peritoneum was closed and the usual closure of the abdominal wall was carried out.

The specimen measures 11x14x10 cm. At the upper and lower poles a small amount of compressed renal parenchyma is seen. The lower pole of the kidney is replaced by a large soft round mass 13 cm. in diameter. It is entirely encapsulated. The tumor has extended into the upper pole of the kidney by a wide pedicle between the pelvis and posterior capsule. The pelvis is dilated to 7 cm. in diameter and the ureter shows slight dilatation in its upper 9 cms. On section we find the large lower pole mass filled with necrotic material and old blood. Among the cystic border papillary projections of friable tumor are seen. The upper pole extension is solid with much coagulated blood. The tumor capsule varies from 4 to 7 mm. in thickness.

Microscopic sections from the lower pole mass show papillary projections of tumor extending from the wall into the cyst. The cytoplasm of the cells is practically all destroyed, leaving darkly staining irregular pyknotic nuclei with tags of shrunken cytoplasm attached. The cells along the blood vessels are better preserved, but no true picture of the original tumor is available.

The tumor tissue at the upper pole is likewise destroyed and there is much fibrosis. Certain areas show iron pigment and hyalinization. The renal substance presents dilated tubules as in hydronephrosis. There is some hyalinization and slight interstitial fibrosis. The glomeruli are intact, but small, suggesting interference with their blood supply. A small section of the suprarenal gland is normal and we can find no change in that organ due to irradiation.

The impression is embryonal carcinoma.

Case 6.—S. W., aged 12, was admitted to the Johns Hopkins Hospital December 20, 1932, because of a hard mass in the left side. Three months before admission the patient developed an unexplained fever, with left upper abdominal pain and a temperature of 102°. He was kept in bed for 2 or 3 days and his temperature returned to normal. His physician found a mass in the left upper quadrant of the abdomen which he considered an enlarged spleen. The patient had had no hematuria. His temperature usually rose in the afternoon to 101°. He had had very little pain, but had noticed the firm mass in the left upper quadrant of the abdomen.

The patient was a thin, pale boy of 12 years, very alert and cooperative. Examination of the head was negative. There was no general enlargement of the lymph nodes. The lungs were clear. The abdomen presented, on inspection, a fullness in the left upper quadrant, and on palpation a firm, quite irregular, nodular mass, extending to within 2 cm. of the crest of the ilium and almost to the midline of the abdomen. The right kidney was not palpable. The liver was not enlarged. The external genitalia were negative. Temperature, pulse and respirations on admission were nor-

Fig. 9
Case 6. Intravenous urogram showing a typical mid-pole cortical tumor before irradiation.

mal. The red blood count was 1,870,000, white count 10,000, and hemoglobin 85 per cent. Plain x-ray film showed a large mass in the left upper abdomen. Pyeloureterogram showed a mid-renal filling defect probably caused by cortical tumor (*Fig. 9*).

The patient was referred for deep x-ray therapy, receiving a tumor dose of 1775 "r."

January 16, 1933, the tumor was considerably shrunken in size so that it was palpable on inspiration about half way between the costal margin and the crest of the ilium. It had receded laterally so that the border of the tumor reached the lateral border of the left rectus muscle. On expiration the tumor moved upward for a distance of 2 cm. Phenolsulphonephthalein test showed an appearance time of 3 minutes, half hour collections 65, 20, 10 and 5, total 100 per cent. The blood urea was 32 mg. per 100 c. c., hemoglobin 61 per cent. The patient had been having nose bleeds and it was considered that some of his loss of hemoglobin was due to this cause. Three hundred c. c. of citrated blood were given on January 17, 1933. Between February 6 and February 22, 1933, he received an additional tumor dose of 1146 "r." A tumor dose of 2210 "r" was given between May 4 and May 31. Seven transfusions were given during this interval. During the summer and fall the patient lost weight and had several nose bleeds. On October 23, 1933, the blood count showed a polycythemia with hemoglobin 110 per cent, red cells 6,400,000, and white cells 9,200.

October 27, 1933, operation was done under spinal anesthesia, with 150 mg. novocaine and nitrous oxide oxygen. Nephrectomy by Dr. H. H. Young was accomplished through the transperitoneal route, incision being made along the border of the left rectus muscle and then opened laterally in the form of a T. The large vessels over the surface of the tumor were ligated. Because of the large size of the tumor, the pedicle could not be tied immediately. The tumor was freed from the peritoneum medially, after releasing adhesions to the descending colon. The mesenteric vessels were not injured. Due to the extraordinary size of the vessels and close approximation of the splenic vein, ligation of the pedicle was very difficult. The kidney was quite adherent posteriorly, but it was not attached to the diaphragm. There was considerable bleeding, possibly from one of the renal veins which was controlled by pressure until the mass could be removed. When this was accomplished and all vessels tied, the pack was removed and no further bleeding occurred. The patient was considerably shocked and was given 2,000 c. c. of 5 per cent glucose and 500 c. c. of citrated blood during the operation. The tumor apparently was completely removed and also a glandular structure that lay above the renal vessels posterior to the upper pole of the kidney.

Pathology (8865).—The specimen is a large rounded mass 15x12x9 cm. It consists of the left kidney, with a large mid-renal tumor, completely covered by the

Fig. 10
Case 6, Path. 8865. Saggital section of left kidney with large mid-pole tumor. The tumor is well encapsulated and there is no direct invasion of the pelvis or calices. Note the central area of necrosis separated from the actively growing tumor by fibrous tissue. The necrotic center is undoubtedly the result of irradiation. The peripheral tumor evidently has grown in the four months' interval between the last irradiation and nephrectomy.

true renal capsule. Portions of the extrarenal capsule have been removed with the tumor. Over the surface are large veins and arteries, the largest of which is seen on the anterior surface, coming from the lower pole with many small branches over the anterior surface of the tumor. Posteriorly, there are several branches from the main renal vein. The tumor measures 10x11x9 cm. It is slightly irregular on the surface and presents nodularities over which the capsule is adherent. There are several areas of subcapsular hemorrhage. The tumor involves the anterior and posterior surfaces of the kidney in the mid-pole, but there is no invasion of tumor in the upper or lower pole. The pelvis is mostly extrarenal and communicates with the ureter just below the mid-portion of the tumor. There is some hydronephrosis with considerable dilatation of the ureter. The tumor is slightly more dense than normal kidney tissue, but at the most lateral point of the tumor there is some softening suggesting necrosis. On cross section we have an extraordinary picture of a mid-cortical tumor, which has invaded the kidney anteriorly and posteriorly, leaving the upper and lower portions of the kidney free of tumor. The tumor is fairly well encapsulated. The center of this tumor is entirely necrotic. This area measures 5 cm. in diameter and is surrounded by a zone of fibrosis varying from 4 to 7 mm. in thickness. There seems to be no active tumor within this fibrous zone, but outside of this zone there is an area 2 cm. thick, which presents a typical picture of hypernephroma, with islands of cells, yellowish red with a zone of iron pigment about them. There are cystic areas and many areas are filled with blood clot. There are also areas of hyaline degeneration. Examination of the renal vessels shows no inclusions of the tumor within the vessels and there is no involvement of the superficial vessels that cover the tumor (*Fig. 10*).

Sections from the kidney tissue outside the tumor show small hemorrhages immediately beneath the capsule. These are probably caused by trauma at operation. The glomeruli are intact and Bowman's capsules are normal. There is no interstitial fibrosis. There are a few polymorphonuclear cells near the pelvis between the tubules, but there is no abscess formation. There is slight, cloudy swelling of the tubules near the periphery, but there is nothing to indicate interstitial nephritis as it can be developed by irradition (*Fig. 11*). Sections from the tumor show a thickened fibrous capsule which is here and there infiltrated with tumor cells. The tumor is composed of extraordinarily large, clear cells in more or less papillary formation, with large spaces, some of which are blood filled. The nuclei are rather small and present numerous mitotic figures. It is quite typical of hypernephroma (*Fig. 12*). In some areas we see adenoid formation. The outstanding fea-

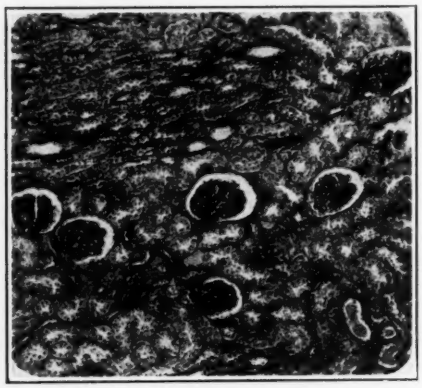

Fig. 11

Case 6. Normal renal tissue of removed kidney. No damage by preoperative irradiation.

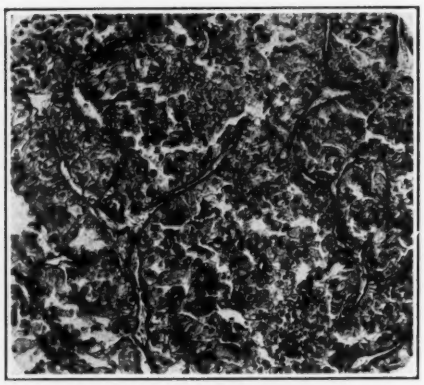

Fig. 12

Case 6, Path. 8865. Photomicrograph from the actively growing tumor on the periphery. Note the extraordinary size of the cells with small, darkly staining nuclei, the papillary formation and blood-filled spaces.

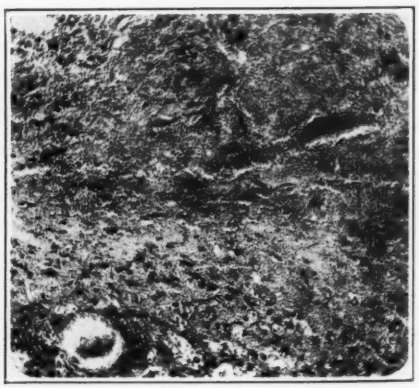

Fig. 13

Case 6, Path. 8865. Photomicrograph showing fibrous tissue dividing the area of active tumor and area of necrosis. On one side we see large clear cells in papillary formation with small, dark nuclei and blood-filled spaces, typical of hypernephroma. On the other side of the septum, necrotic tissue with fibrous change and apparently dead epithelial cells.

ture is the extraordinary size of the individual cells. Separating the living tumor from the necrotic area in the center, we have a thick band of fibrous tissue which is infiltrated by tumor cells. The central portion of the tumor is a large mass of necrotic tissue without definite morphology (*Fig. 13*).

CONCLUSIONS

(1) Tumors of the hypernephroma type and embryonal carcinomata are radiosensitive.

(2) Papillary carcinomata of the renal pelvis and the malignant papillary cyst adenomata are radioresistant.

(3) Irradiation has caused a striking reduction in the size of radiosensitive renal tumors.

(4) Irradiation has produced extensive morphological changes in sensitive tumors with extensive fibrosis, hyalinization and necrosis. The cells become shrunken. The cytoplasm may contract around the nucleus. In certain cases the tumor has been almost completely destroyed and replaced by fibrous tissue.

(5) Normal renal tissue has not been injured by irradiation in the dosages employed in our cases.

(6) Palpation of the tumor should be avoided as much as possible to prevent expressing tumor cells into the blood stream.

(7) Tumors which were inoperable because of their great size have been rendered operable by shrinkage following irradiation.

(8) Reduction in the size of sensitive tumors begins almost immediately after the institution of irradiation. Remarkable reduction in the size of the tumor takes place within three weeks.

(9) We recommend operative removal of the tumor after completion of the first series of radiation (approximately 3 weeks), allowing a few days for rest and transfusion if the degree of anemia justifies it.

(10) A regrowth of the tumor may occur if operation is long delayed after completion of irradiation.

(11) Preoperative irradiation has not made operation more difficult in our experience and in certain cases has simplified nephrectomy.

(12) The renal pedicle should be ligated before freeing the tumor, thus diminishing the risk of metastasis.

PRIMARY LYMPHOSARCOMA OF THE SMALL INTESTINE WITH METASTASES TO THE GALLBLADDER AND BOTH SUPRARENALS*

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In 1932, Ullman and Aheshouse[1] reviewed an article by Graves who, in 1919, had collected 249 cases of lymphosarcoma of the intestines. They collected 125 additional cases and reported one of their own, bringing the number to 375, which, with the one here reported, makes 376. Their thorough review of the literature will be referred to frequently.

This tumor occurs more frequently in the small intestine than in the large, the ratio being about 2 to 1, the most common site being the ileum.

It occurs most frequently in the first, third and fourth decades of life. Males show a greater predisposition than females in the ratio of 5 to 2, mostly in the white race. The etiology is obscure, although trauma has been strongly considered as a factor.

There is no characteristic clinical syndrome. In most cases the predominant symptoms are those of an acute or a chronic intestinal obstruction. The type of the symptoms varies, and seems to be chiefly dependent upon the duration of the growth and the degree of obstruction produced by it; whether by intussusception, adhesions or invasion of the wall by the growth. Abdominal pain occurred in every case studied. Usually it is constant and confined to the location of the tumor, is of an indefinite nature, sometimes colicky, but not affected by eating. Nausea and vomiting are commonly present. A tumor mass may be felt in various parts of the abdomen, most frequently in the lower quadrants. The stools contain blood in only one out of six cases. When the clinical picture suggests intestinal obstruction, the administration of contrast substances by mouth is often dangerous, as an incomplete obstruction may be converted into a complete one. However, if the obstruction be suspected

*Read in Section on Pathology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

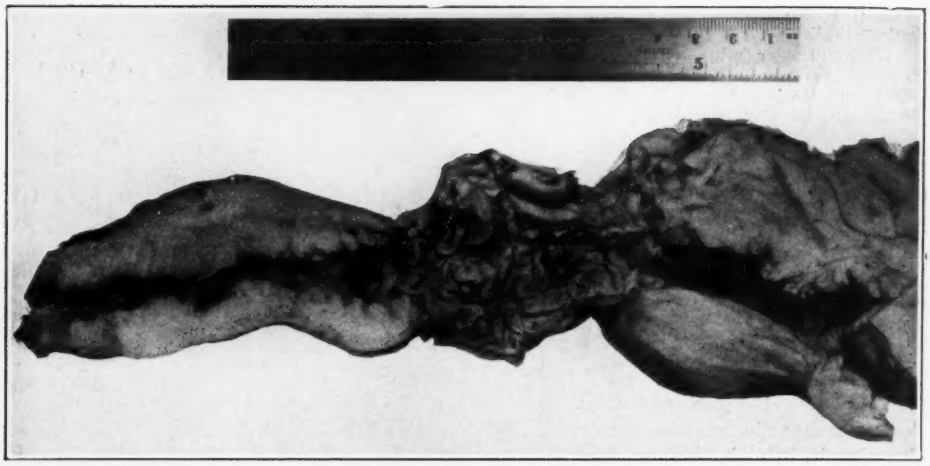

Fig. 1

Lymphosarcoma small intestine. At left, the gut is bisected, showing the thickened walls, which, however, never occlude the lumen. The growth has a glistening white, somewhat granular appearance, resembling cold lard, and is extremely friable. Next appear two inches of normal gut, followed by a larger tumor mass, the upper portion of which is cut longitudinally; the lower portion having a smooth peritoneal surface which nowhere shows any tendency to perforation. At the levels of the involved areas, the lumen is constricted to a greater or less degree, but is never occluded.

in the large intestine, x-ray examination following an opaque enema is clearly indicated and of great value.

Fig. 2

Site of the primary growth in the jejunum. The mucosal glands are shown, the villi are densely infiltrated with lymphoid tumor cells, which almost totally replace the muscular coats beneath. Reduced from X 170.

The blood picture in nearly all cases shows an anemia of the hypochromic type and a moderate leucocytosis from 10,000 to 15,000, with an increase of the polynuclears of 70 to 85 per cent. No case showed a leukemic picture, indicating that this disease is a new growth rather than a blood dyscrasia.

Pathology.—The growth may appear annular or polypoid or a combination of the two may be present. It usually begins in the lymphoid follicles of the submucosa, gradually invading the other intestinal coats, but rarely penetrating the serosa. As the tumor grows, ulceration of the mucosa occurs. A decided tendency to aneurysmal dilatation of the gut is often seen, but stenosis is rather more common. Complete occlusion never develops from the sarcomatous growth.

There are two types of growth, one of which is derived from the reticulum cells of the germ centers of the lymphoid follicles and of the pulp cords, producing the large round cell type with definite cytoplasm. The other produces the small round cell type with little cytoplasm, being derived from the lymphocytes. The two show no essential differences clinically. A fine connective tissue framework forms the stroma, sparse in some areas, thickened in others, due to fibrosis. The presence of a raw debris-covered ulcer of the mucosa is common.

Metastases.—Nearly every case is accompa-

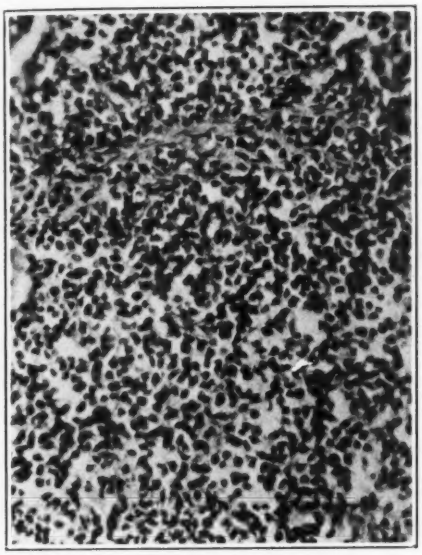

Fig. 3

High power of primary growth in small intestine, showing details of the cells, most of which are of the reticular variety. Hyperchromatism, mitoses and the very scanty connective tissue framework are noted. Reduced from X 810.

nied by metastasis in some form, tending to spread early to the lymph nodes of the mesentery. In advanced cases metastatic involvement of practically every abdominal organ has been found: the kidney, liver and spleen being most frequently involved, followed in order by the omentum, gallbladder, lung, appendix, ovary, axilla, elbow, diaphragm, heart,[2] parietal peritoneum, and transverse colon. No case has been previously reported in which the suprarenals were involved.

Treatment.—A radical resection of the involved gut and its mesentery offers the most hope, especially when the tumor is localized, and the lymphatic involvement is not too extensive. As a palliative, a side-tracking operation is indicated, especially when the growth is so extensive as to render a resection impractical. Irradiation should be employed in every case; in the inoperable ones to control the tumor growth; and in the operable ones to prevent recurrences and metastases.

Prognosis.—Untreated cases are invariably fatal, usually in a short time. Among 85 operative cases studied, the average duration of life was 19 months after operation. One patient lived 10 years, another over 11 years afterward.

CASE REPORT

C. E., aged 31, a white married male, was admitted to the hospital August 23, 1932, complaining of nausea, vomiting, and diarrhea. His family and past history apparently had no bearing on his present condition.

His present illness started five weeks previously, with nausea and vomiting about 2 hours after meals. A severe diarrhea accompanied this, but no blood was seen in the stools. This attack lasted three weeks. One week before he entered the hospital the diarrhea again commenced, this time much worse, with about 50 watery stools daily. The vomiting ceased. His normal weight of 150 pounds was reduced. He had had no gastro-intestinal disturbances nor abdominal pain until the present illness. Thirst was a major complaint. There had been no cough, hemoptysis, dyspnea, palpitation, nor easy fatiguability.

His blood pressure was 92/70. He was poorly nourished, listless, and apparently very ill. The head, eyes, nose, ears and neck were normal. The teeth were in poor condition; there was marked pyorrhea alveolaris; the tongue was red and beefy; the tonsils appeared harmless. The thorax and the lungs were normal. There was a slight systolic murmur at the cardiac apex,

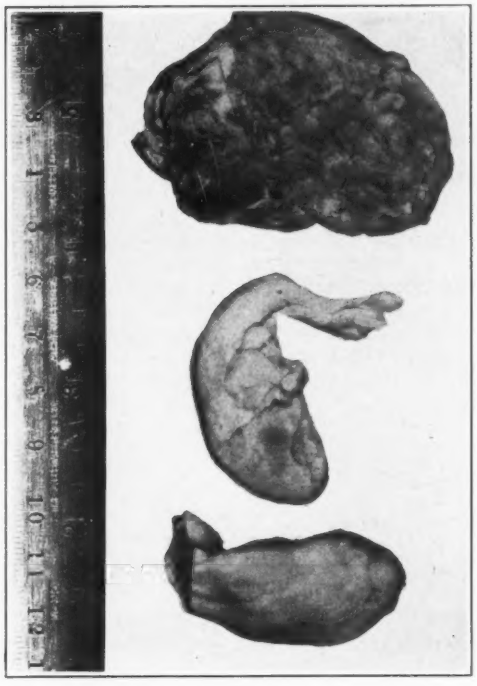

Fig. 4

Metastasis to the suprarenal, appendix, and gallbladder, showing the preservation of the original form of the organs without penetration of the serosa.

not constant, and not transmitted. The rate and rhythm were regular, but rapid.

The abdomen was scaphoid, with moderate gurgling in the cecal region. There was tenderness around the umbilicus. A small movable mass was palpated in the lower left quadrant about midway between the umbilicus and the left anterior superior spine. The patient improved slowly, but the mass persisted.

The stools were foul and liquid, containing a few pus cells, but no blood. The urine showed a trace of albumin; otherwise the chemical and the microscopical examinations were negative.

The patient improved enough to leave the hospital, but returned two weeks later, complaining of an enlarging mass in the upper left quadrant. His general condition was better than when he was seen before. The blood pressure was now 114/74, temperature 97.4°, pulse 112, respiratons 22. The blood count showed 5,000 leucocytes, 70 per cent hemoglobin, red blood cells 3,870,000, color index 0.9, polynuclears 81 per cent (45 per cent young and staff forms, 36 per cent segmented forms), lymphocytes 15 per cent, monocytes 1 per cent, eosinophils 2 per cent, and basophils 1 per cent. The smear showed no abnormal cells. The blood sugar was 115.4 mg. per 100 c. c., nonprotein nitrogen 104.6 mg., and icterus index 3.75.

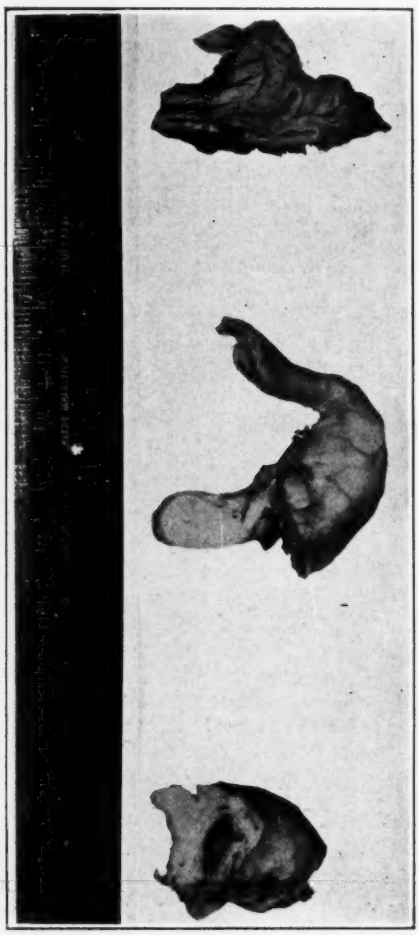

Fig. 5

Suprarenal, appendix and gallbladder: cross sections showing how the neoplasm appears to be plastered on the surface of the organs without greatly altering the parenchyma. Note the normal appearance of both the cortex and the medulla of the suprarenal, the neoplasm being plastered around it.

At operation, September 17, under spinal anesthesia employing 100 mg. of neocaine, a midline incision was made, and an annular tumor of the upper jejunum was seen, with marked involvement of the retroperitoneal lymph nodes. Had it not been for a break of the bowel, the case was clearly inoperable. The break was at the ligament of Trites, making an anastomosis impossible, so 58 cm. of the tumor-bearing jejunum were resected, a tube was inserted at this point, and the distal end of the small bowel was sutured to the abdominal wall.

The immediate postoperative condition was good. However, he became rapidly worse, dying five days after the operation, eight weeks after the onset of symptoms.

Necropsy.—Two hours after death an examination shows the body of a very poorly nourished white male, with a surgical incision of 17 cm. to the left of the midline of the abdomen. No postmortem rigidity is present. On opening the abdomen, large numbers of recently formed adhesions are encountered, with much sero-purulent fluid. The stomach is distended with gas, its posterior wall is congested. The duodenum is normal, in its upper portion. Nine cm. below the pyloric ring the intestinal wall is greatly thickened, soft, and friable, with much hemorrhage into both the wall and the lumen, which is patent. Here begins the 38 cm. of jejunum which was removed at operation, which is here described.

The serosa is smooth and shiny, with a few small ovoid nodules projecting. Three portions show a marked thickening of the walls, from 12 to 35 mm. On section the neoplasm is white, glistening, friable, and finely granular, having almost the appearance of cold lard. The mucosa in the involved areas is ulcerated, thin and hemorrhagic. Between these areas the intestine is normal. The portions showing the greatest involvement show a marked stenosis, but nowhere is the lumen occluded, nor are there any aneurysmal dilatations. Below the resected portion the intestine is sutured to the abdominal wall. The ileum is bound down to the pelvis by adhesions of a fibrinopurulent type. About the middle of the ileum there is a large dilatation due to atony, which is filled with a bloody fluid. The large intestine is markedly adherent throughout, and shows many small, elevated, ovoid pinkish-gray nodules projecting into the serosa.

The omentum contains several small nodules of the same character as those seen in the large bowel. It is plastered throughout to the small intestines, due to the peritonitis.

The appendix is greatly enlarged, with thickened walls and a stenosed lumen. Its appearance is similar to the neoplastic portions of the small intestines.

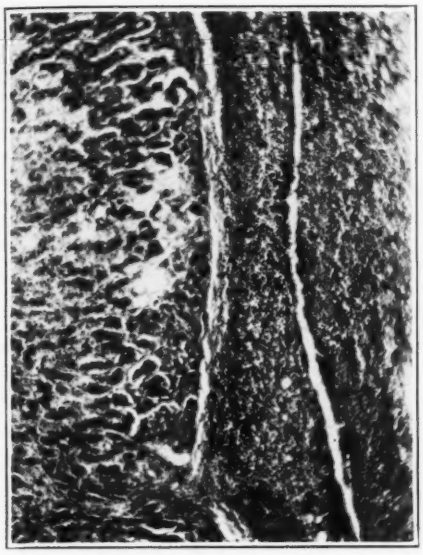

Fig. 6

The zona glomerulosa and reticularis of the suprarenal cortex are shown to the left; to the right is the tumor separated by the narrow capsule. Note the normal appearance of the suprarenal and the sharp limitation of the tumor by the fibrous tissue band. Reduced from X 170.

The spleen is normal in size and shape; on its surface are several recently formed adhesions. No metastases are present.

The liver is enlarged to 6 cm. below the right costal margin; the lower portion of the right lobe posteriorly shows recent fibrino-purulent adhesions. There are no metastases.

The gallbladder is rather firm, somewhat smaller than normal, and shows markedly thickened walls having the same appearance as the neoplastic intestines. The lumen is very small and contains a thick, green mucus.

The left kidney is somewhat enlarged, with a thickened cortex, as is also the right kidney. Their capsules strip easily.

The left suprarenal is slightly enlarged, weighing 8 grams. On section, the cortex and the medulla appear normal, but the capsule is thickened, pinkish-gray, and of the same appearance as the intestinal neoplasms. The right suprarenal is greatly enlarged, weighing 23 grams. Its shape is perfectly preserved. On section, the apparently normal cortex and medulla are seen; they are surrounded by the neoplastic thickening of the capsule similar to, but in a far greater degree than, the left suprarenal.

Many retroperitoneal lymph nodes are enlarged.

The bladder is covered with a thick fibrino-purulent exudate. The prostate and the pancreas are normal.

The thymus, left lung and thoracic cavity, heart and blood vessels are normal. The pleura of the right lung is densely adherent from the fourth rib in the mid-clavicular line upward posteriorly to the apex. There are no metastases.

Microscopically the jejunum shows a marked infiltration of all coats with tumor cells of the lymphoblastoma type. Under high power most of the cells are seen to be derived from the reticulum, while a smaller number are of the smaller, more compact lymphoid type. The fine connective tissue stroma is very scanty. The origin of the growth is in the lymphoid tissue of the submucosa, spreading to all the coats and almost replacing the muscularis. At the levels of greatest involvement the mucosa is ulcerated, very thin and covered with hemorrhagic debris.

The suprarenal capsules are markedly thickened by infiltration with the same types of malignant lymphoid cells, while the cortex and the medulla are not invaded.

All coats of the gallbladder are invaded to a marked degree with the typical lymphoid cell.

The appendix shows a similar invasion.

The anatomical diagnoses are:

(1) Lymphoblastoma, primary in the lymphoid tissue of the jejunum, with metastases to the omentum, retroperitoneal glands, both suprarenals, gallbladder, appendix, large intestine and mesentery. The predominant type is annular, although there are many small polypoid growths of the small intestines.

(2) Hemorrhage into the upper portion of the jejunum at the site of resection, both within the walls and within the lumen.

(3) Diffuse plastic purulent peritonitis, chiefly in the pelvis.

Fig. 7

The villi of the mucosa of the gallbladder are also densely infiltrated and enlarged by the tumor cells, which extend outward to largely replace the muscular coats. A few smooth muscle strands are shown.

(4) Cloudy swelling of both kidneys.

(5) Cloudy swelling of the liver.

(6) Pyorrhea alveolaris.

The cause of death is lymphoblastoma, primary in the jejunum, with multiple metastases. A contributing cause is diffuse purulent, plastic peritonitis, with multiple adhesions.

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CONTINUOUS IRRIGATION OF THE BLADDER IN CERTAIN CASES OF CYSTITIS*

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University, Virginia

It is needless to repeat before this audience the axiom that cystitis is usually a secondary process and can logically be expected to clear up under routine therapy after related pathological conditions, local or remote, have been corrected. Nevertheless, I am sure that every urologist encounters the occasional patient of either sex for whom, as Wendel has said, cystitis has become the main pathological entity even after the primary and proximate causes have been removed. One can go even further and safely state that intense bladder inflammation may be, from the beginning of one's observation of a case, the only abnormality demonstrable in the genito-urinary tract or elsewhere in the body, for that matter. A limited number of cases of cystitis fail utterly to respond to standard treatment and, by the entailed suffering and the futile efforts to relieve it, try the souls of patients and physicians alike. I wish to renew attention to the possible value of continuous irrigation in such instances of intractable vesical infection.

In the medical literature of the past fifteen years I have found scant reference, by title at least, to continuous irrigation of the bladder for the treatment of cystitis. Likewise a recent consultation of some twelve standard urological text-books has revealed mention of the procedure in only two and then by a casual line or so. Caulk[1] reports "in some of the stubborn rebellious cases of cystitis, continuous irrigation through a two-way catheter is extremely effective if the patient's urethra will stand it." No details are furnished. Burnam[2] has "used constant irrigations with good results, keeping two small catheters cemented side by side in the urethra." Jones[3] has obtained excellent results, after two and five weeks, respectively, in two cases of chronic ulcerative cystitis by the use of sterile water irrigations, through a metal two-way catheter, for three-hour periods twice daily. Shaw and Young[4] have described a useful addition to the usual method of decompression for the chronically obstructed prostatic by means of which constant bathing of the bladder with an antiseptic solution is maintained during the period of decompression and thereafter if infection is troublesome. Hunner[2] has established a vesico-vaginal or a suprapubic fistula and then maintained continuous irrigation through the fistula and the urethra, the patient resting the while in a tub of warm water. Wendel[5] put tubes to the bladder suprapubically and perineally in a man and kept up a constant irrigation for three months, ultimately obtaining a cure in a seemingly hopeless cystitis of ten years' duration. The drastic sounding procedures of Hunner and Wendel testify eloquently to the degree of bladder invalidism which some patients present and to the miserable existence which makes them welcome any measures promising relief.

My experience with continuous bladder irrigation has been gained solely from the use of the simple, ingenious and efficacious apparatus described by Hinman[6] in 1919. The principles and details of its operation are shown in the accompanying diagram and photograph (*Figs. 1* and *2*).

When properly set up, the apparatus functions automatically as long as there is fluid in the reservoir and the line is open. The irrigation can be run at any drip-rate desired by regulation of the stop-cock. The degree of bladder distention at each filling is determined by the height of the U-tube (8). Should the reservoir run dry, the tubes must be cleared of air and refilled with fluid before the apparatus will work satisfactorily. The possibility of such a mishap can be avoided by using a rubber seat-valve at-

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*From the University of Virginia, School of Medicine, Department of Urology.

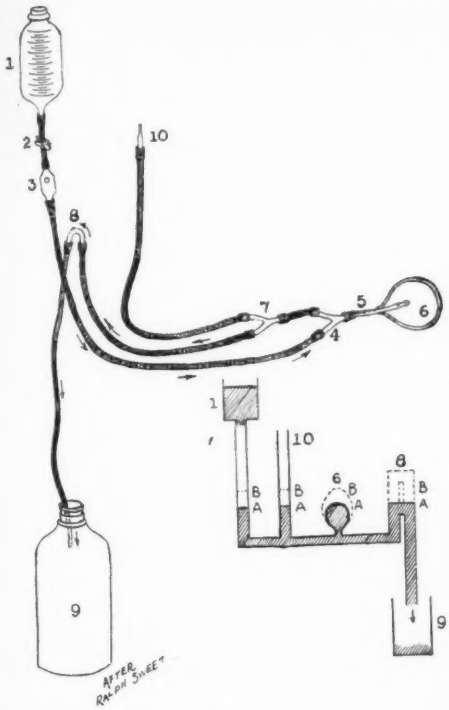

Fig. 1

Diagram of the Hinman apparatus for continuous and automatic bladder irrigation (redrawn, with slight modification, from Hinman).

From the reservoir (1) flow to the bladder (6) is visibly regulated (3) by stop-cock (2). Catheter (5) is one-way. Return flow follows the upper limb of Y-tube (4), the lower of Y-tube (7) and so to receptacle (9) as siphon is intermittently completed at U-tube (8). Capillary vent (10), connected to outflow line by Y-tube (7), cushions tug on bladder during siphonage. Opening in drip tube (3) is sealed with adhesive save when necessary to lower level of backed-up fluid. Y-tube 7 should be above level of Y-tube 4 to avoid aspirated air from vent (10) entering inflow line.

The principle of the apparatus is shown in the smaller diagram. Levels A and B correspond to heights of U-tube (8).

Useful tube lengths are: 1 to 3, 8 inches; 3 to 4, 36 inches; 4 to 7, 24 inches; 7 to 10, 24 inches; 7 to 8, 10 inches; 8 to 9, 36 inches.

tached to a float by a short rod so that, when the reservoir solution is sufficiently low, flow will be stopped by the seating of the valve. Intermittent bladder drainage by siphonage will continue, but without irrigation until the reservoir is refilled. As indicated in *Fig. 1,* the Y-tube in the discharge line should be higher than the Y-tube connected with the catheter in order to prevent the suction of air from the capillary vent into the inflow tube and catheter. A one-way catheter has worked better in my hands than a two-way. For comparable lumen of outlet, the two-way catheter has to be of larger size than the one-way and has so proven more irritating to bladder and urethra. A two-way catheter of smaller size has given trouble by becoming clogged with exudate or blood much more frequently than a one-way catheter of equal diameter. In women I have used a short mushroom catheter.

Some patients will not tolerate the apparatus because of the extreme irritability of the bladder and urethra. Others become comfortably adjusted after a difficult initial period, during which the apparatus must be disconnected from time to time. The judicious use of opiates is necessary to tide some patients over the first painful days. Still others are immediately relieved of much of their discomfort and promptly

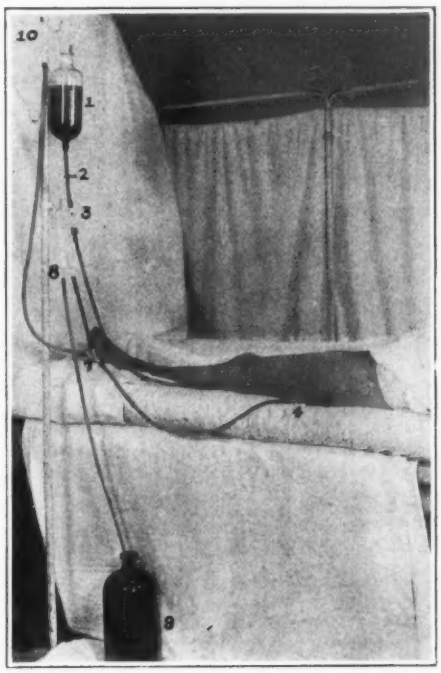

Fig. 2

Hinman apparatus in use. Numbers correspond to those of Fig. 1. The violence of the terminal tug of emptying is less with the receptacle (9) nearer the bladder level than shown here. Capillary vent (10) is obtained by perforated rubber tip on an irrigating nozzle. Details of the set-up will be clearer if viewed through a magnifying glass.

revel in the rest and sleep obtained for the first time in months.

The irrigating solution employed in a given patient has varied according to the exigencies of the case. Boric acid in full or half strength, acriflavine 1:5000, mercurochrome 1:1000 and potassium permanganate 1:8000 have all been employed at various times. I have attributed bladder improvement under continuous irrigation as much to rest, drainage and mechanical cleansing as to any particular antiseptic action. This view is supported by results reported in the literature where only sterile water or normal salt solution served as the irrigants. In alkaline cystitis we have employed boric acid, 0.5 per cent acetic acid solution, and more recently, after the work of Randall,[7] phosphoric acid in a strength of 1 per cent or less.

I cannot give the exact number of patients in whom we have utilized the apparatus of Hinman, because over the years we have failed to index them on the basis of this form of therapy. It will suffice for my purpose to list some of the conditions in which the continuous irrigation has proven most helpful and so suggest its range of application in my hands.

In one patient with a residual tuberculous cystitis after left nephrectomy, the urine was pus-free after continuous irrigation for three weeks. In a similar case the nocturnal frequency was reduced in twenty-five days from a practical incontinence to four voidings. These results are in accord with the original report of Hinman. Essentially normal bladder function was obtained for two men with chronic ulcerative cystitis of over six months' duration, seemingly due to the gonococcus in both instances, after treatment for ten and fifteen days, respectively. The apparatus afforded valuable help in certain phases of the handling of a six-year-old girl with atony of the bladder (one having a capacity of 1,300 c. c.), cystitis, and bilateral pyelonephritis. More recently we have been employing the contrivance with definite advantage in the prostatics with severe cystitis, both before and after resection. Our best results in the treatment of alkaline cystitis have, by all odds, been secured by constant irrigation. The first patient in whom I used the Hinman apparatus was a woman with incrusted cystitis. The result in this patient exemplifies the value of the procedure so well that I shall report the case in some detail.

CASE REPORT

Mrs. W. J. H., aged 27, admitted January 30, 1922, had had symptoms of an intractable cystitis for the preceding three years. The onset followed childbirth. The nocturnal frequency of urination had gradually increased from 3 to 15 and there was a corresponding day frequency. Bladder discomfort had become constant, and the terminal urine was usually blood tinged. There had been no febrile attacks and no renal pain. Aside from the discomfort connected with her bladder, her health had been good. No relief had been obtained from oral medication or series of instillations and irrigations elsewhere.

Tuberculous infection was suspected, but repeated stains for acid-fast organisms were negative. Oddly enough, culture of the bladder urine gave no growth on her first admission. The cystoscopic picture was that of a marked alkaline cystitis. The mucosa in the main was covered by shaggy incrustations and was fiery red and ulcerated where exposed. The ureteral orifices could not be recognized; the bladder capacity was 70 c. c. The fresh urine was uniformly alkaline.

Irrigations and instillations of various antiseptics were employed without benefit. The injection of an emulsion of Bulgarian bacilli thrice daily for three weeks secured slight improvement. Two abscessed teeth, and tonsils which appeared normal, were removed during her stay in the hospital. The temperature curve was on a normal level throughout that time. The bladder symptoms were essentially unimproved when the patient was discharged, March 27, 1922, 68 days after admission.

She was readmitted May 16, 1922. Her frequency, urgency and hematuria were unchanged. Bladder culture gave a diphtheroid bacillus and a non-hemolytic streptococcus. The urine remained constantly alkaline. Instillations of Bulgarian bacilli were used for two months, but with no more improvement than might have been explained by the rest in bed. The irrigating apparatus of Hinman was first employed July 9, 1922, and was utilized almost continuously from then through July 30, 1922. The irrigating solution was boric acid. The change in the bladder condition was almost miraculous. By the latter part of July the incrustations had entirely disappeared and all ulcers were healed. Both ureters were then catheterized; the kidney urines were pus-free and both pyelograms were normal. Bladder capacity had increased to 250 c. c. The patient was kept under observation for an additional two weeks without any local treatment. During this period she rarely had to void at night, and would go as much as six hours between voidings by day. Upon her discharge August 14, 1922, the urine contained 10 to 15 pus cells to the high power field and was consistently acid.

The patient returned in August, 1924, with an ulcerative cystitis, but one of less anatomical severity and without incrustations. Relief was obtained after continuous irrigation for six weeks and several later fulgurations of persisting ulcers. She reported by letter in January, 1927, that she considered her bladder to be normal. She has not been heard from since that date.

In conclusion, I would make it perfectly clear

that continuous irrigation is not urged or even suggested as a cure-all for intractable cystitis. In my experience it has failed to secure betterment for the patient as often as it has succeeded, probably more often. From time to time, however, it has afforded relief when the more customary forms of therapy have been unavailing. This potential value, I think, is not generally appreciated. For these reasons I feel justified in renewing attention to the procedure.

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DISCUSSION (*Abstract*)

Dr. Earl H. Floyd, Atlanta, Ga.—I have had no experience with this particular method of treatment which would justify me in saying just how efficient it is. One might guess from the appearance and the mechanics of the apparatus that it is truly an ingenious one. It might be a solution of one of our very difficult problems of treating stubborn and intractable infections of the bladder. Some of them, as you know, are not only difficult to treat, but are very difficult to examine satisfactorily. Any method that would offer some hope of cure is to be desired. Unfortunately, however, the cases in which this method is suited are, I think, more or less intolerant to an urethral catheter and the irritation produced might necessitate frequent changing of the catheter. A one-way catheter, however, would be less harmful in this respect than two catheters.

Of course, irrigations could be borne more easily through a suprapubic opening than through the urethra. The catheter would be free from any pathological structures, as a rule, and would allow either intermittent or continuous irrigations to be given with less discomfort and, too, the bladder could be put at rest, which is a form of treatment recommended in some cases of tuberculous cystitis following the removal of the original urinary focus.

Phosphoric acid instillations in the bladder as an acidifier we have found very good. We are also enthusiastic about the use of the ketogenic diet to lower the pH of the urine. In some instances it has given us unusual improvement.

If I should use the method of continuous irrigation, and I think I shall, it would be in selected cases and this, I take it, is in agreement with Dr. Neff's point of view.

REGENERATION OF THE LONG BONES FOLLOWING COMPLETE SUBPERIOSTEAL REMOVAL IN CASES OF EXTENSIVE OSTEOMYELITIS*

By G. V. Brindley, M.D., F.A.C.S.,
Temple, Texas

A relatively early subperiosteal removal of the entire shaft of long bones for the treatment of extensive osteomyelitis and the subsequent marked regeneration of bone from the periosteum are to be briefly discussed in this paper. No attempt will be made to go into details of the many phases and methods of treatment of this disease. We have operated upon a few patients with osteomyelitis who had such an extensive destruction of bone that all, or a major portion, of the shaft was removed subperiosteally.

The case records of two patients form the basis for this paper. Both patients had extensive osteomyelitis involving the entire humerus and also each had a suppurating arthritis of the shoulder and elbow joints. Both patients were violently septic and their conditions were considered grave; even serious concern was felt for their recovery. The operation performed for each of these patients was a subperiosteal removal of the entire humerus with its articular surfaces and, at the same time, the shoulder and elbow joints were opened widely for adequate drainage. In both patients, a new bone regenerated from the periosteum, which maintained function to a gratifying degree.

Case 1.—A man, aged 25, four months before entrance to the hospital was taken with a sharp pain in the right arm, near the elbow. The pain radiated up the arm to the shoulder. It was very severe and almost constant. The patient had high fever accompanied by chills. The elbow swelled and was opened by a small incision twenty days after the acute onset. This did not relieve his symptoms and the fever and swelling continued until fifty-five days after the initial symptoms, when a free incision was made and the outer half of the lower six inches of the shaft of the humerus was removed. There was no fever after three days following this operation. There was, however, a marked amount of purulent drainage and the elbow became stiff. The patient was admitted to the hospital three months after the last operation. At this time there were several sinuses of the right arm and a rather

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marked swe'ling of the right elbow with but little motion in this joint. The patient appeared quite septic. Particular attention is called to the marked involvement of bone found by the roentgenologist. He reported as follows: "There is an extensive osteomyelitis throughout the humerus, including the head, the entire shaft and both condyles. The disease extends into the head of the radius and the upper two inches of the ulna. There is, also, a small area of destruction in the inferior margin of the neck of the scapula."

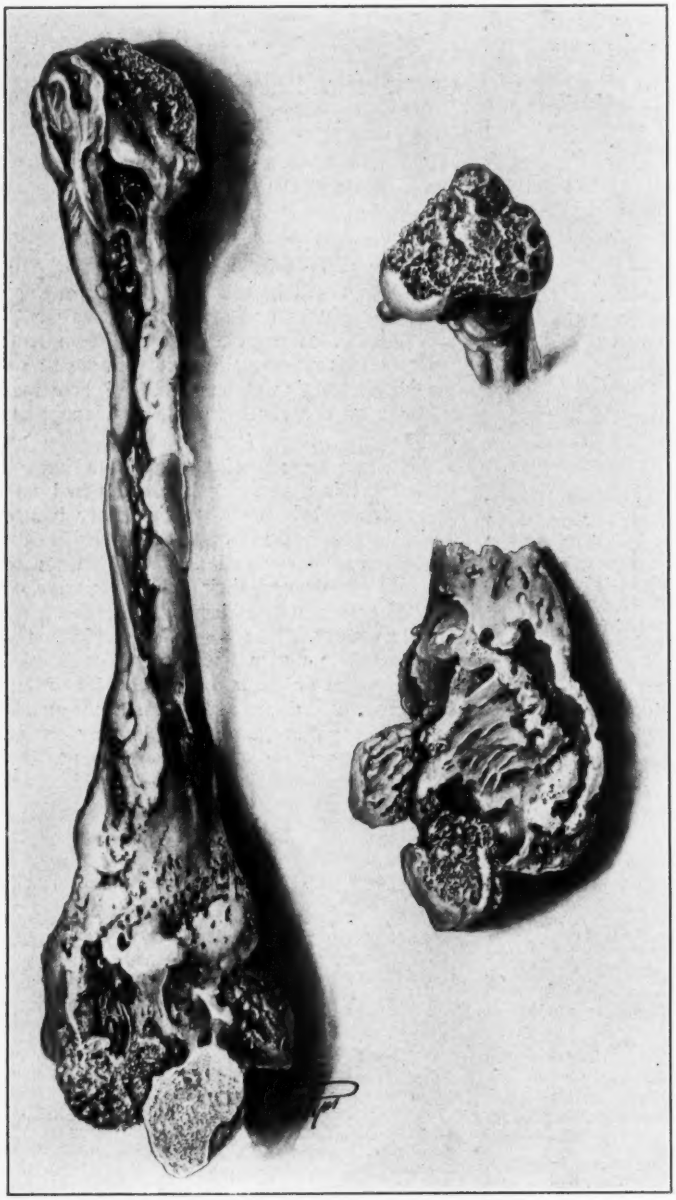


Fig. 1

Case 1, 60215. Drawing of bone after removal. Observe the extensive osteomyelitis throughout the entire bone, with involvement of the articular surfaces.

The patient was prepared for surgery and the following radical operation was done: "A six-inch incision extending down to the bone was made on the posterior aspect of the distal portion of the right arm. The periosteum was dissected from the bone in this region, then the entire lower half of the humerus was removed. The elbow joint was widely opened and there were removed also about one inch of the ulna and about one-half inch of the head of the radius. Next, an incision exposing the bone was made on the anterior, outer, upper surface of the right arm. The periosteum was reflected from this portion of the shaft and the remaining portion of the bone removed, making a complete subperiosteal removal of the humerus. The diseased area of the neck of the scapula was removed by curet."

The patient had a prolonged and stormy convalescence. Metastatic foci, necessitating drainage, developed in practically every long bone of the body. However, a new bone grew from the retained periosteum which maintained function of the arm to a fair degree.

Several errors were made in the handling of this patient, which, in a large measure, were responsible for the development of the extensive bone disease which made the above radical procedure necessary. The condition was incorrectly diagnosed at the onset as "rheumatism." Later sarcoma was considered because the bone destruction was very marked, and again proper surgical measures were delayed. Another error was the institu-

tion of stab drainage, which was wholly inadequate.

Case 2.—A man, aged 51, whose illness began about two months prior to entry into the hospital with a carbuncle on the back of the neck. A second carbuncle formed a little later. These were removed by knife excision. Twenty-four days before admission to the hospital, the patient began to have severe pain in the left arm, which soon began to swell. A diagnosis of phlebitis was made. An abscess of the arm was drained six days later by a small incision. He had another drainage operation seven days after this and a little later still, a third incision and drainage were done. Upon admission to the hospital, the patient was found to have a marked toxemia. His blood count was: 3,400,000 red cells, hemoglobin 60 per cent, white cells 15,000, with 84 per cent polymorphonuclear leucocytes. The roentgenologist reported an extensive osteomyelitis of the head and shaft of the entire left humerus, which had produced a marked destruction of the bone. A blood transfusion was given and the following day a subperiosteal removal of the humerus was performed. The operation was as follows:

"An incision some eight inches in length was made exposing the shoulder joint and extending down along the anterior, outer surface of the arm. The shoulder joint was filled with pus and a marked destruction of the head and upper portion of the shaft of the humerus was found. Another incision was made along the posterior outer surface of the arm, exposing the lower portion of the humerus. Again an extensive destruction of bone (by osteomyelitis) was present and there was also a suppurating arthritis of the elbow joint. Due to the fact that the disease involved the entire bone, and, also, because there was a suppurating arthritis of both the shoulder and elbow joint, a subperiosteal removal of the entire left humerus was done and the infected joints were opened freely for drainage."

The patient made a rather rapid and uneventful convalescence. The accompanying temperature chart of the patient shows very graphically the rapid improvement following operation. A new humerus regenerated from the conserved periosteum with a fair return of function of the arm.

There were two errors in the early management of this patient which accounted for the extensive bone involvement. The condition was treated as a phlebitis at first and later was inadequately drained three times by small stab wounds.

Unquestionably the factors which make necessary radical and disabling surgery are: late diagnosis, incorrect diagnosis, watchful waiting due to the failure of the physician to appreciate the rapid de-

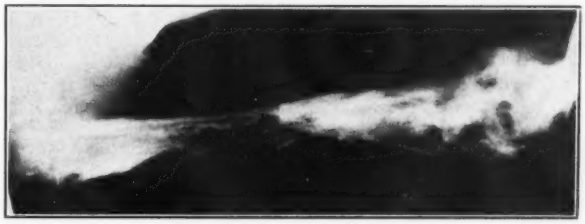


Fig. 2

Case 1, 60215. Demonstration of pathology by roentgenogram. Observe the extension of disease into the scapula, ulna, and radius with destruction of joints.

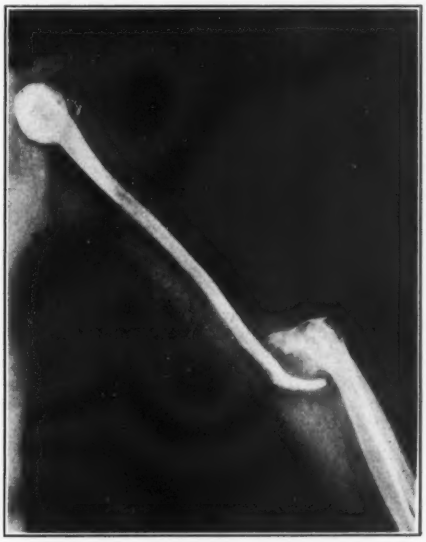


Fig. 3

Case 1, 60215. Regenerated bone. Observe articular ends.

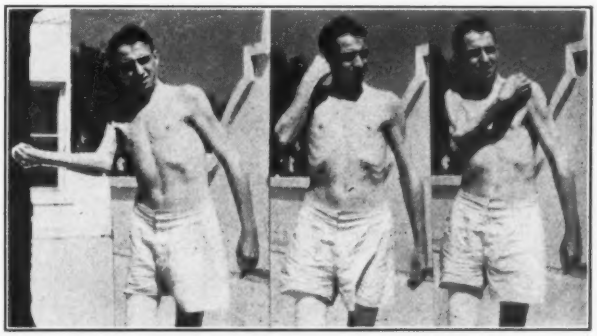


Fig. 4

Case 1, 60215. Observe return of function as demonstrated by movie.

Fig. 5
Case 2, 82053. Roentgenogram demonstrating regeneration of bone from retained periosteum.

structive spread of this disease, and the failure of the surgeon to establish adequate drainage at the first operation. The advanced degree of bone destruction which was found in these two patients is seen only when the diagnosis has been made late or an incomplete operation has been performed. Certainly a correct diagnosis should be made earlier, then proper drainage instituted promptly to prevent extensive disease. It is wholly unnecessary to remove the entire shaft of the bone for the treatment of an acute osteomyelitis, if the patient receives proper surgical treatment early. The early surgical management of these two cases, however, was not satisfactory. The patients had a severe infection of an unusual degree and extent. There was in both cases, a violent osteomyelitis which involved the entire shaft and the contiguous joints and, also, there was an extension of the disease even to the other bones which entered into the formation of the joints. For patients with this extensive disease of bones and joints, who are overwhelmed with infection, an apparently radical operative procedure is indicated.

There is to commend this procedure the fact that the patient is immediately and by one operation relieved of the primary and major portion of his infection. The operation can be performed with dispatch, certainly more quickly and with less trauma than can be done the usual wide guttering of the shaft of the diseased bone. The need of further major surgical procedures for the removal of sequestra is eliminated. The development of a septicemia is less likely to occur. A limb and, sometimes, a life will be saved by complete removal of the diseased tissue. A fairly satisfactory bone can be expected to regenerate in most instances from the conserved, thickened periosteum.

The marked power of bone regeneration from the periosteum is due to the fact that with the onset of an acute osteomyelitis there is a rapid migration of osteogenetic cells from the haversian canals of the underlying bone to the loose areolar tissue of the periosteum. It is from these cells and the osteoblasts of the periosteum that the new bone forms. There is a factor influencing the degree of bone regeneration expressed by Wolff's law worthy of remembering. It is that the amount of bone regeneration is modified by nature's demand for it. According to Albee, occasionally there will be a failure of bone reproduction from the periosteum. Should regeneration fail to occur, then for such a patient a bone grafting operation can be done.

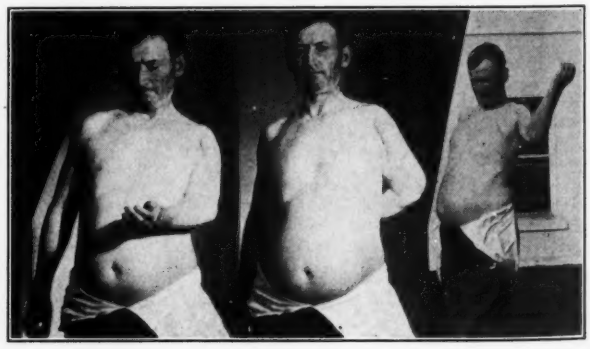


Fig. 6
Case 2, 82053. Observe return of function as demonstrated by movie.

The apparently radical operation performed for both of these two patients was done with the primary aim of conserving life rather than the function of a limb. Each of these patients, however, developed a strong and well formed new bone from the conserved periosteum. The joints were somewhat unstable, but notwithstanding this fact, there was a restoration of function to a very surprising and gratifying degree. Each of these patients had a serviceable, useful arm. These case reports have been made not so much with the idea of commending the operative procedure as they have been presented primarily to show nature's power for marked regeneration of bone, its faculty for reformation of joints and its effectiveness in restoration of function.

SUMMARY

Acute osteomyelitis rapidly produces extensive destruction of bone. The condition demands early diagnosis and then immediate free drainage. A late diagnosis and an inadequate first operation are the two most common errors made in the management of this disease. Proper surgical treatment instituted early will limit the further destruction of bone and prevent extensive disease. Occasionally a bone becomes so completely involved by osteomyelitis that a subperiosteal removal seems rational. A new bone will regenerate from the periosteum in most instances. The two patients whose case records were presented in this paper had a subperiosteal removal of a long bone and grew another bone of fair size from the conserved periosteum. There was a fair degree of return of function after the development of the new bone.

DISCUSSION (*Abstract*)

Dr. Joseph D. Collins, Norfolk, Va.—Dr. Brindley very forcefully brings home to us the appalling destruction of bone that takes place when acute osteomyelitis is not promptly recognized and promptly and adequately treated.

A large majority of these cases occur in children and the diagnosis is frequently missed until bone destruction is far advanced. We are often misled by negative x-ray findings. Acute osteomyelitis does not give a positive x-ray in the early stages, and to wait until the diagnosis can be made by x-ray is to invite trouble.

The question of the regeneration of bone from the periosteum alone has been the subject of much discussion and experimentation. For a number of years a great many observers were of the opinion that such regeneration did not take place. However, it has been proven repeatedly that bone can and does regenerate throughout its entire length when there is nothing left but the periosteum. This bone is usually devoid of medullary cavity and remains throughout life a dense sclerosed mass.

The most favorable time for this operation is between the second and sixth weeks, during which period the soft involucrum can be left behind.

In a current issue of the *Journal of the American Medical Association*, Bosworth, of New York, reports six cases of subperiosteal resection of the tibia. His best results were obtained in three cases in children under nine years of age. These children obtained weight-bearing bones. In the other three cases, the oldest being 16, the regeneration was not complete. He concludes that after the age of eight years failure of regeneration in whole or in part will probably necessitate later osteoplastic procedures. As both of Dr. Brindley's cases occurred in adults, I think his results are most remarkable, and I want to congratulate him. This was certainly a justifiable procedure in the cases reported, because otherwise amputation would have been necessary.

Dr. Edward T. Newell, Chattanooga, Tenn.—Dr. Brindley has brought to our attention a rather new and very difficult procedure for the cure of osteomyelitis. Many methods have been used of late, dakinization, the Orr treatment, and so on.

Dr. Brindley's films show what he has accomplished by this piece of major surgery and he is to be commended for his untiring efforts in obtaining these results. I can remember a similar case which I had in a young girl some fifteen or twenty years ago. I was rewarded with success in this case, but unfortunately the epiphysis was involved and the radius, the bone involved, did not develop in accord with the ulna. There was considerable resultant deformity in this case. While I do not believe that this method is one that will gain general use, it is one which offers good results in certain selected cases.

Dr. Brindley (closing).—The apparently radical operations performed on these patients are indicated only for the exceptional and the neglected patient, but for such a patient this procedure may not only conserve a limb, but may prove to be a life-saving measure. After these extensive operations it is surprising and gratifying to find to what degree function returns.

I trust the motion picture has demonstrated in a satisfactory manner that there has been a marked regeneration of bone from the periosteum and that with this development of new bone there has been a return of function to a fair degree.

These case reports have been made not with the idea of commending the operative procedure, but primarily to show nature's power for marked regeneration of bone, its faculty for reformation of joints, and its effectiveness in restoration of function.

A STUDY OF CHILD'S SLEEP*

By GLENVILLE GIDDINGS, M.D.,
Atlanta, Georgia

The importance of sleep for relief of fatigue in health and for the restoring of physical vitality in disease is a truism. Nothing serves more thoroughly to restore an individual's sense of recovery and mental alertness than sound, uninterrupted, normal sleep. Some two years ago we conceived the idea that sleep might be used as an index of nervous stability or instability. More particularly were we interested in this as it applied to children. What constitutes normal sleep for a child? How may it be accurately measured? Will sleep vary with a child's age, with its sex, or with the seasons? These constitute but a few of the numerous problems that arise. After a review of the literature on child's sleep, and it is very meager, we thought that possibly sleep motility or movements made during sleep might be used as a criterion of both the quality and quantity of a child's sleep. We knew from previous investigation by Johnson and Weigand[1] that adults normally change position not infrequently during sleep. Applying this to children, we hoped by observing them at an interval of fifteen minutes throughout the night to obtain information as to their restlessness. These observations were carried out in a darkened dormitory, the nurse using a small flashlight to determine a child's position. This position was jotted down, using symbols on a prepared form, as has been previously reported.[2] This method was soon found to be unsatisfactory, and as a whole unreliable, on account of the many minor movements which eluded detection. For this reason we changed to the electrically recording hypnograph.

METHOD AND APPARATUS FOR RECORDING SLEEP MOVEMENTS

The machine which we are using for recording sleep was originally described by Renshaw and Weiss[3] in the *Journal of Psychology* in 1926. In brief, the principle involved is as follows: attached to the bedspring is a mechanism consisting of a perpendicular piece of metal containing alternate inserts of bakelite and brass. A small brass wheel travels up and down this piece which makes or breaks an electric contact with the slightest movement of the individual occupying the bed. This contact is conducted through cables into an adjoining room in which is placed the hypnograph itself. The hypnograph consists of a battery of twenty-four stylus pens (one for each bed) which write upon an uniformly traveling roll of paper eight inches broad. Two colors of ink are used in the pens, one for the males and another for the females. As this paper passes under the pens it is stamped electrically by a timer at one minute intervals, so that at the end of a night's observations this can be ruled out sixty minutes to the hour and each body movement accurately recorded, minute by minute, for the entire nine hours, or 540 minutes, that the individual is in bed. As the contacts are made or broken by the bed mechanism, electro-magnets on each pen of the hypnograph makes offsets from the base line on the record. Beside the hypnograph are relay boxes so arranged that if the circuit through any bed ceases functioning properly, the signal lamp will light and remain burning until the condition is corrected. Thus, should an individual leave his bed for any purpose during the night, the relay lamp will at once notify the operator of this fact. *Fig. 1* shows a close-up of the hypnograph with pens and paper in place for making a record.

Fig. 2 shows a short section of a hypnograph record taken immediately after retiring. The very great activity that is shown on this tracing will be noted, as compared with *Fig. 3,* which was taken from the record at the end of the first hour. The difference in active and quiet minutes on these two sections is striking and quite constant.

At the end of each night's observations the active minutes, that is, any minute during which a sleeper makes any movement, are counted, hour by hour, and recorded for each of the

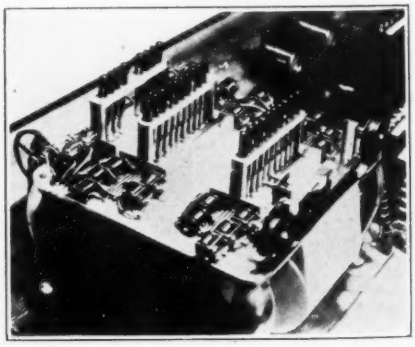


Fig. 1

*Read in Section on Pediatrics, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

SHOWING ACTIVITY FIRST FEW MINUTES AFTER RETIRING

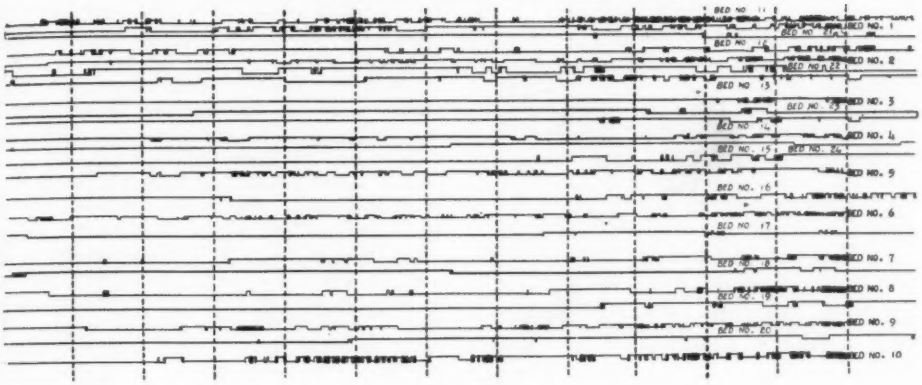


Fig. 2

SHOWING ACTIVITY END OF FIRST HOUR

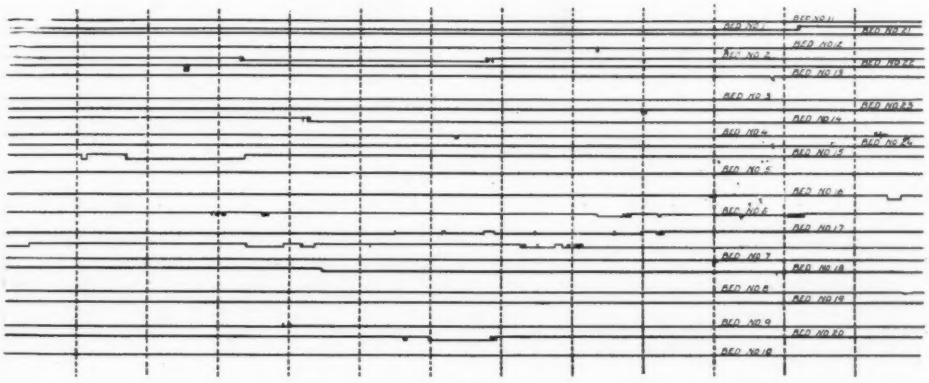


Fig. 3

twenty-four individuals, the total number of active minutes being entered at the end of the night. From this record the observations are copied daily onto the individual's record.

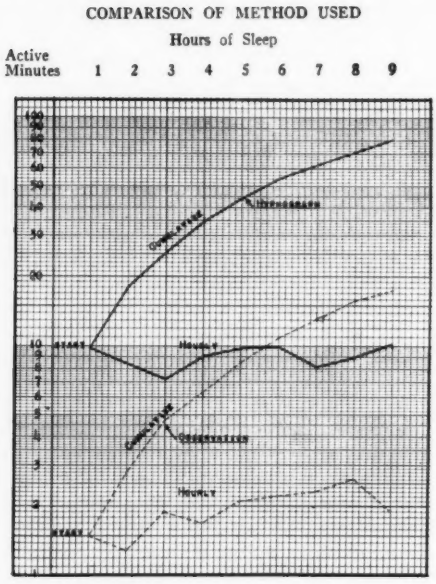
At the beginning of the work each individual who was to be studied was given a physical examination and such laboratory observations as urinalysis, complete blood count, blood pressure, electrocardiograph tracing, basal metabolic rate, stool examination, and the like. At the initial examination all foci of infection that were found were removed. Likewise those individuals with organic defects were excluded from the group.

SLEEP MOVEMENTS IN HEALTH

We shall consider first what constitutes the normal sleep pattern.

I should like to show you two graphs of the same individual observed over a period of fifteen consecutive normal nights, one the result of visual inspection, which is shown in broken lines, and one in which the movements were recorded by the hypnograph, shown in solid lines (*Fig. 4*). It is quite apparent that while certain evidence is gotten by observation alone, it is by no means so accurate or complete as when the movements are recorded electrically. For example, to date we have graphic records of about 80,000 hours of sleep and the highest period we have found of any individual sleeping without any body movement is 107 minutes (one hour and forty-seven minutes).

These observations of sleep movements in health are based on a study of 3,240 hours of

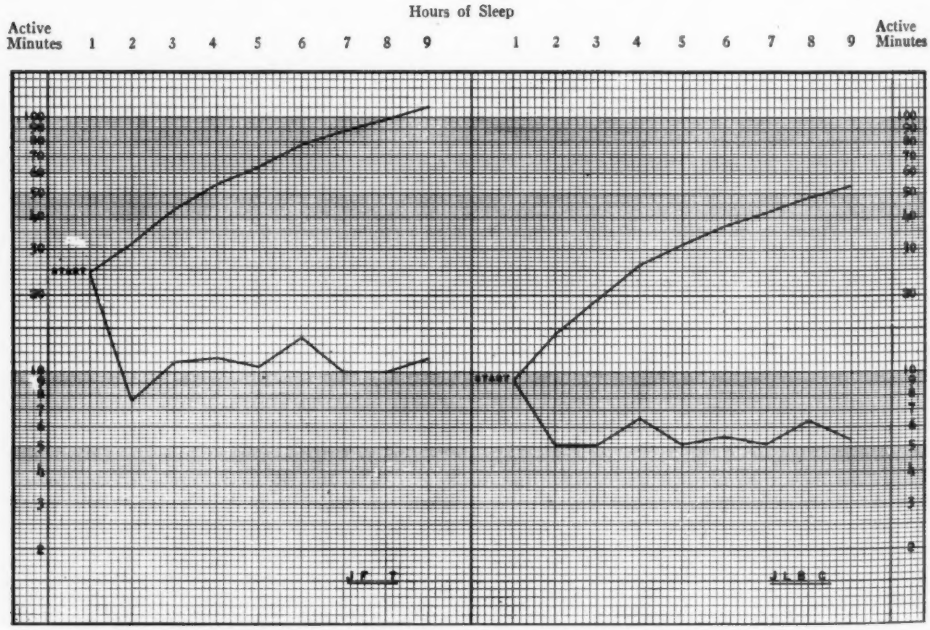


B.L.B., sex male.

Fig. 4

normal sleep. Except in a very general way no two individuals have the same sleep pattern. We know that the first hour of sleep is the most active hour and the next most active is the last regular hour of sleep. We can go further than this and say that the most active part of the night is the first thirty minutes after retiring and the most quiet part is the second thirty to forty-five minutes. For example, if an individual is in the habit of retiring at 10:00 p. m. and getting up at 7:00 a. m., he will show more activity, more sleep movements, between 10:00 and 11:00 p. m. and 6:00 and 7:00 a. m. than during any other two hours of the night. Aside from this, generalities cease and what is quite normal for one person may be distinctly abnormal for a second person, assuming both to be in normal physical condition. This variability of sleep pattern is equally true for males and females.

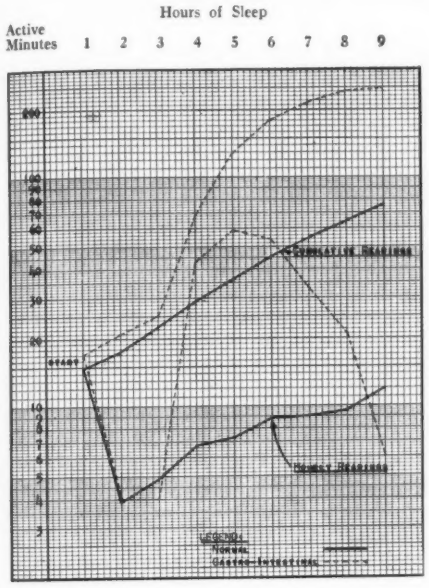
The graphs are all plotted on ratio paper. The hours of sleep are listed at the top of the graph with a scale showing the active number of minutes to the left of the graph. The lower limb of the graph shows the body movements, hour by hour, of the individual under observa-



Normal Males.

Fig. 5

EFFECT OF APPENDICITIS ON THE NORMAL SLEEP PATTERN



F.B., sex male.

Fig. 6

tion; the upper limb of the graph is a summation of the minute movements throughout the night. In *Fig. 5* are two examples of fifteen consecutive normal nights' sleep in males, showing a wide variation, yet both quite normal. Thus in the graph to the left the individual showed 110 active minutes of sleep during the night, while the one to the right showed only 53 active minutes.

SLEEP MOVEMENTS IN DISEASE

I should like to touch now, perhaps briefly, on some sleep observations that might be of general medical interest. Sleep movements in disease may be quite different from sleep movements in health in the same individual. That we may show that this method of sleep study is an accurate response to an individual's sleep, we should like to show graphs of a child suffering pain. In *Fig. 6* is seen the effect of a gastro-intestinal upset (possibly appendicitis), the sole manifestation of which was acute abdominal pain.

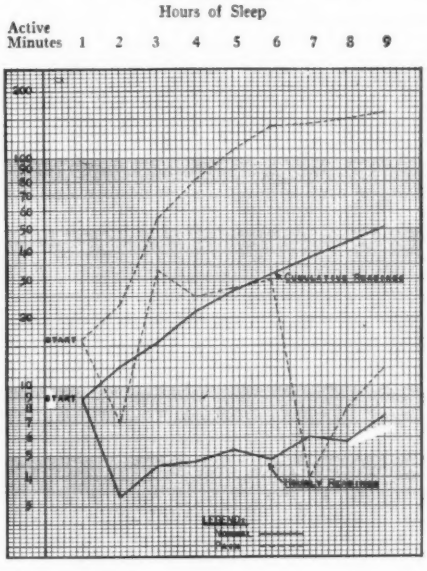
This child retired at the usual hour, 8:30 p. m. At 9:30 p. m. he had showed 17 active minutes and between 10:30 and 11:30 only 4 active minutes per hour, which you can seq is approximately normal for the child. At about 11:30 p. m. he was seized with acute abdominal pain and his active minutes at once rose to 43 between 11:30 and 12:30, to 53 active minutes between 12:30 and 1:30, and between 1:30 and 2:30 a. m. to 54 active minutes. With the subsidence of the pain the active minutes rapidly dropped at 3:30 to 30 active minutes an hour and at 4:30 to 22 active minutes, while at 5:30 a. m. he showed only 6 active minutes an hour. From the upper limb you can see that instead of having only 75 active minutes, which was the normal average, he showed 248 active minutes throughout the night.

In *Fig. 7* we have a similar tracing, but instead of having abdominal pain the child suffered from toothache. Apparently the discomfort began at 9:30 p. m. and continued until 1:30 a. m., at which time her sleep dropped to four active minutes an hour and was apparently quiet for the rest of the night. In this case, in which the average number of active minutes throughout the night was only 50, under the influence of pain it rose to 113.

These records are shown merely to illustrate graphically the well known clinical fact that pain interferes with sleep. We may further state, however, that any condition which produces physical discomfort increases sleep motility or makes a child more restless. By discomfort we include other factors than simply pain.

In *Fig. 8*, for example, is shown a child with anal pruritus due to pin worms. The record was made during a period of five consecutive nights before treat-

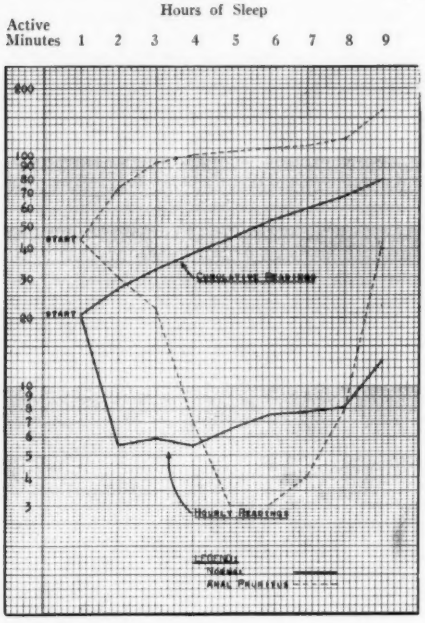
EFFECT OF PAIN (TOOTHACHE) ON THE NORMAL SLEEP PATTERN



C.H., sex female.

Fig. 7

EFFECT OF PRURITUS ON THE NORMAL SLEEP PATTERN



R.H., sex female.

Fig. 8

ment and five consecutive nights after treatment. The active minutes average 80 per night after treatment, while the average before treatment was 162. Furthermore, it may be seen from this graph that the individual was extremely restless during the early hours of the night and the early hours of the morning, both apparently due to the subconscious knowledge of the anal irritation.

As a further example of the effect of physical discomfort on sleep is shown *Fig. 9*, which represents one night's observations on a child with a head cold. This child had no fever and suffered solely from the effects of the cold. From this tracing it will be noted that the child's rest was markedly disturbed during the entire night and that his total sleep movements rose from a normal of 72 to a total of 195.

This interference of a common cold with quiet sleep is constant. We have noted it repeatedly.

Another feature of some interest was the restlessness produced in children who have partaken of indigestible foods. More particularly have we reference to the type of food contained in boxes from home sent to boarding school children. While gross evidence of a gastro-intestinal upset, such as nausea, vomiting and pain, was generally lacking, an increase in sleep movements was almost constantly present following the receipt of a box from home.

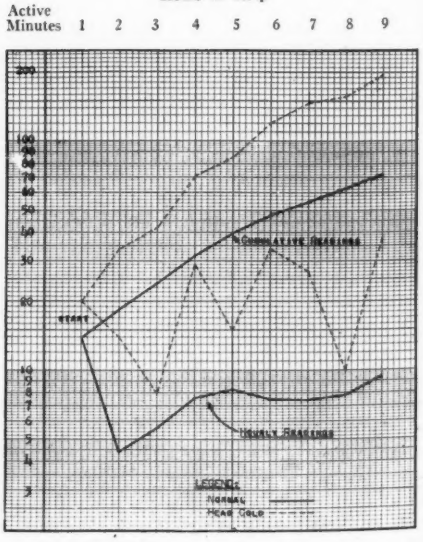
EFFECT OF FEVER ON SLEEP MOVEMENTS

I should like to mention now some observations made during the past winter showing the effect of fever and antipyretics on sleep. I believe it is the rather prevalent medical belief, and is so stated by Krehle,[4] Wright,[5] and others, that the usual febrile diseases are associated with restlessness. The observations which I wish to show were made on uncomplicated cases of influenza. No case suffered pain other than the general malaise that is associated with this disease.

In *Fig. 10* is a graph in which the child's temperature at 8:30 p. m., or bed time, was 101° F. It is evident that this febrile condition interfered very little with his night's sleep as a whole. He was a bit active the first and second hour, after which he slept with very little increase in restlessness throughout the night. The following day his temperature was reduced by an antipyretic given every four hours and at 8:30 p. m. was normal (see *Fig. 10*). The difference in restlessness during this night was markedly greater than during the period he had received no antipyretic. Not only was he considerably more restless during the first hour, but this restlessness continued throughout the night despite the fact that he had no pain or other discomfort.

In *Fig. 11* similar observations were made on an-

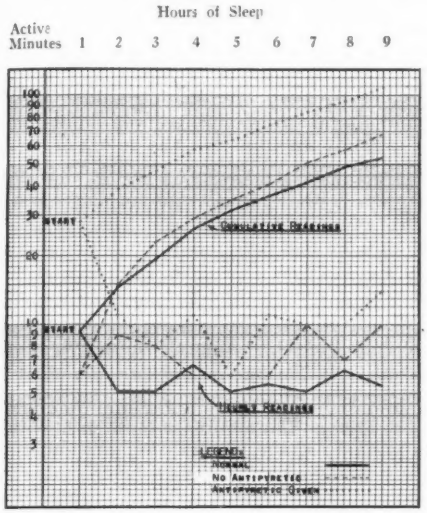
EFFECT OF A HEAD COLD ON THE NORMAL SLEEP PATTERN



V.M.H., sex female.

Fig. 9

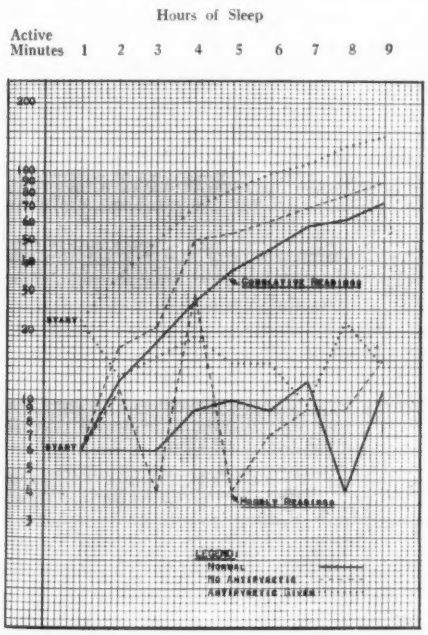
EFFECT OF INFLUENZA ON THE NORMAL SLEEP PATTERN



J.L.B., sex male.

Fig. 10

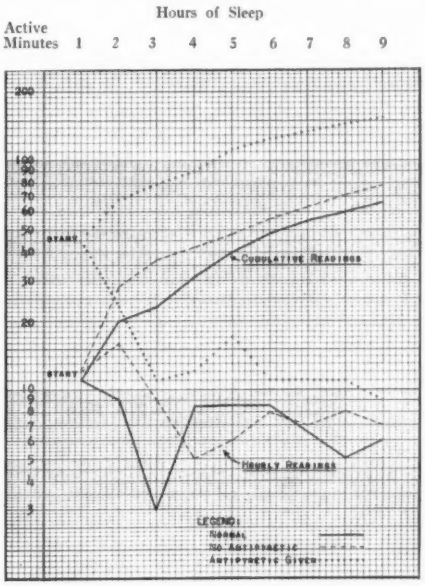
EFFECT OF INFLUENZA ON THE NORMAL SLEEP PATTERN



G.B.

Fig. 11

EFFECT OF INFLUENZA ON THE NORMAL SLEEP PATTERN



C.L.T., sex female.

Fig. 12

other patient with influenza who showed a temperature of 102° F. at bedtime and who had received no antipyretic. His sleep with a single exception of one hour was very little disturbed. *Fig. 11* shows this same individual with temperature reduced to normal at bed time by an antipyretic received every four hours throughout the day. Here again restlessness is definitely shown throughout the night.

Fig. 12 shows another patient with influenza with temperature of 101.4° at bed time who had received no antipyretic. Likewise there was very little evidence of restlessness. *Fig. 12* shows the same individual after having received an antipyretic every four hours with temperature normal at bed time. Here again is extreme restlessness very probably due to the antipyretic, as the individual suffered no more distress on one night than on the other.

From these observations it is suggested that the administration of antipyretics for the reduction of temperature may interfere to a considerable extent with a child's sleep. This, of course, is not applicable when an antipyretic is given for the relief of pain.

SUMMARY

From the foregoing experiments I believe it is fair to conclude as regards normal sleep:

(1) In a child accustomed to retiring early, soundest sleep comes before midnight.

(2) Any physical discomfort, whether it be pain or otherwise, markedly interferes with sound sleep.

(3) Fever, *per se*, interferes very little with sleep.

(4) Antipyretics, which are given for the reduction of fever and which do reduce the fever, may be associated with an increase in sleep movement. Whether this increase is due to the antipyretic or the decrease in the fever is unknown.

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478 Peachtree Street, Northeast

DISCUSSION (*Abstract*)

Dr. M. Hines Roberts, Atlanta, Ga.—It is surprising that so little study has been done on the physiology and pathology of sleep in childhood.

I have had the good fortune to observe Dr. Giddings's studies from time to time and to discuss with him some of his problems. Many of our preconceived notions regarding the effect of various agencies upon sleep receive a rather rude jolt. He has shown, for example, that caffeine-containing beverages at bed time do not influence sleep in children, that hot and cold baths produce little change in the sleep pattern, that intensive study preceding sleep has little or no effect, that the use of antipyretics may indeed induce restlessness. On the other hand, as one would expect, the ingestion of a heavy meal in the evening produces marked restlessness; certain emotional factors, such as exciting games, new toys, strange surroundings, produce definite changes in the sleep pattern.

As we consider the subject, many questions arise which we should like answered. What effect does the daytime nap have upon the child's sleep pattern? What is the most favorable time for this nap? Is there definite correlation between the child's sleep pattern and his so-called spasmogenic aptitude? It is to be hoped that Dr. Giddings will continue his studies and give us the answers to many such problems.

Dr. C. H. Webb, Shreveport, La.—One of the questions suggested by Dr. Giddings's work is whether any correlation may be observed between depth of sleep and enuresis. There is some variance of opinion on this question; some authors hold that enuresis occurs during deep sleep, others that it occurs during light or restless sleep. I wonder also whether any correlation between extreme restlessness and teeth grinding is observable.

TREATMENT OF LEUKEMIA*

By D. Y. KEITH, M.D.,
Louisville, Kentucky

This discussion will be limited to the history and treatment of leukemia as described by many authors. It conforms to the following definition: leukemia is a disease characterized by an increase in the leucocytes in the blood, associated with hyperplasia of the leucoblastic tissues.

History.—The first case was recorded by Hugh Bennett[1] in 1845, who gave it the name of "leucocythemia." A month later, Virchow described a similar condition, which he named "leukemia." Newman, in 1870, described the changes in the bone marrow.

The entire hemopoietic system is involved, the bone marrow, spleen and lymph nodes. The disease begins more frequently in the bone marrow, or lymph nodes, and rarely in the spleen primarily, as occurred in a case here reported.

Etiology.—The cause is unknown. Most observers think it should be classed as a malignancy. In the acute cases the course is rapid, resembling an infection, frequently accompanied by high fever. Occasionally the fever is preceded by a chill. The same phenomena are seen in an acute Hodgkin's, frequently called Hodgkin's sarcoma. Myeloid and lymphatic leukemia are not very rare diseases. The writer has seen twenty-seven cases of myeloid leukemia in the years 1915-1933, inclusive.

Symptoms.—The symptoms are usually insidious; many of the patients with chronic myeloid or chronic lymphatic leukemia look and feel quite well. By far the greater number of myeloid leukemia patients seek a physician for relief of an abdominal tumor that has been discovered by them by accident. A few of them seek advice on account of shortness of breath or anemia. The clinical diagnosis of leukemia is usually very easy. Lymphatic leukemia arising primarily in the spleen is probably the most frequently missed condition. This error in diagnosis occurred in the case reported by the writer.

Lymphatic Leukemia.—Acute lymphatic leukemia is the most terrible of all the blood diseases and is fatal in a few months' time. It is more common in males and much more frequent

*Read in Section on Radiology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

in younger patients (under 20 years). In children it is fatal in from three to six months. The distinctive features are multiple lymph node enlargement, frequently massive, and the presence in the circulating blood of large lymphocytes (lymphoblasts) up to 90 to 95 per cent.

No treatment is of any value except where the lymph nodes of the neck and mediastinum are massive. Here x-ray therapy causes rapid reduction of the enlarged lymph nodes and relieves the distressing dyspnea. Relief is usually experienced in from 24 to 48 hours. Only very small doses of x-ray are necessary, a 20 per cent erythema dose.

Chronic lymphatic leukemia is a disease of older people and runs a chronic course, although it terminates fatally. Patients have been known to live ten or more years. The distinctive features are the small lymphocytes (90 to 95 per cent) and the multiple enlargement of lymph nodes, usually cervical, axillary and inguinal. The abdominal and mediastinal lymph nodes are less frequently enlarged early in the course of the disease. In the later course of the disease the large lymphocyte appears accompanied by anemia.

The roentgen ray in small doses properly given is of service. Prompt response is noted; the patient gains in weight, feels much better and the lymph nodes promptly recede until they are not palpable. It rarely requires more than 30 to 50 per cent of an erythema skin dose to obtain this result.

The case reported is of interest for two reasons: the primary seat of the disease was in the spleen; the primary clinical diagnosis was myeloid leukemia.

Myeloid Leukemia.—Many authors report that enlargement of cervical, axillary and inguinal lymph nodes is present in chronic myeloid leukemia. The findings must be rare or must appear late, as it was not observed in any of the writer's twenty-seven cases of myeloid leukemia.

The clinical diagnosis is confirmed by blood examination. The leucocytes average around 300,000 to the cubic millimeter of blood. All forms of white cells are increased, and from 5 to 50 per cent of myelocytes are present. The red cell count may not be changed early in the disease. Later a drop to 4,000,000 or 2,000,000 or less is seen in a very short time.

The best index to the patient's condition in myeloid leukemia is the red cell count, the percentage of myelocytes present and the hemoglobin. A low red count with 25 per cent or more myelocytes present is an indication for a small dosage, and a slow response to roentgen treatment is to be expected.

Prognosis.—The disease is fatal. A few authors think they have proven by statistics that life is not prolonged by x-ray treatment. No one who has observed the response to radiation therapy in myeloid and chronic lymphatic leukemia will question the efficiency of the treatment. The response to radiation therapy is usually prompt, the patient quickly returning to his or her occupation and, frequently, many months or years of apparent good health may be experienced between treatments. Many of the cases observed by us have lived more than five years, a few eight or more years, and they were able to pursue active and apparently healthy lives during most of this time.

Treatment.—It is useless to enter into a discussion of the medical treatment of leukemia. Except for arsenic, iron and iodine, medicine is valueless.

In myeloid leukemia, benzol has been used in addition to arsenic. Prompt response was occasionally seen by some writers, while others report the results as very poor. Benzol is used very little at present.

RADIATION THERAPY

X-ray therapy has been used and recognized for twenty-five years or more. Pancoast read a paper in 1907 before the American Roentgen Ray Society, recording incompletely the results of roentgen ray treatment in leukemia. The following year (1908) Pancoast and Stengel[2] published a final report on 123 cases of leukemia. Some had received roentgen ray treatment of the entire osseous system and they referred to it as the bone marrow treatment. Following these reports, two schools of therapy were born, namely: one group that treated only the spleen and reported good results; the other group treated the entire osseous system. Today, both methods of treatment are recognized as being efficient.

The effects of radiation therapy are to stimulate the myelocytes, metamyelocytes and young polymorphonuclear leucocytes to go through the rest of the stages of their normal life process, and to die of old age. The latent period after roentgen rays is the time between development and elimination of these cells. The white and red cells mature after effective radiation, as is seen in the polymorphonuclear series. The first

response is an increase in the white cell count, which can be demonstrated in a few hours or the following day. They leave the blood stream through the mucous membrane of the mouth, the stomach and the intestinal tract.

The roentgen rays stimulate certain cells to grow old and die or to be eliminated, while other cells grow more rapidly. Apparently both changes occur after every series of radium treatments. They become less effective after each treatment; therefore as few treatments should be given as possible.

In recent years other methods have frequently been reported in the literature in the form of a three or four gram radium bomb, the treatment being applied to the spleen only. In the recent British literature[3] case reports are seen in which this method has been used. Treatments are given through anterior and posterior circular portals 15 cm. in diameter with 1 mm. platinum filter at a 9 cm. distance. In one case reported, treatments were given daily for seven days; the total dosage was 56,000 mg. hr.

In a review of a case so treated we note that treatments were given in October, 1930, June, 1931, October, 1932, and in April, 1933. The intervals between treatments are much shorter than in our cases where the roentgen ray was applied to the entire osseous system. Probably the same results would have been obtained had the heart alone been treated. The circulating blood would have been affected, which, on reaching the bone marrow, would have caused a change in the myeloid tissue due to a leucocytic substance or leucotoxin that is produced and liberated by the destroyed leucocytes and myelocytes. This is probably how results are obtained when treatment is applied to the spleen alone.

Three important points in radiation treatment of myelogenous leukemia are: (1) the spontaneous leucocytic crisis; (2) the reversal of the sensitivity ratio of red and white cells; and (3) the survival of the irradiated myelocytes. The first is the result of a direct action on the hematopoietic system; the second, an indirect action by means of a leucotoxin liberated by the destructive action; and the third is effected by protein decomposition products, which act on the blood forming system and the circulating blood.

Eugene Milam[4] believes that though the reduction in the number of the white cells is the most apparent phenomenon, it is not the fundamental one in the mechanism. The leucocytic crisis is easy to demonstrate by taking a daily white count.

In a critical survey of the cases we have treated, we observed that a longer interval of apparent good health occurs where treatment was applied to the osseous system, the seat of the disease. Again, we are positive that a longer interval of apparent good health is obtained where higher voltage is used, 160 to 200 kv.

In our recent cases we are varying the voltage according to the density of the bone under treatment. As an illustration, the cortex of the ribs is much easier to penetrate than the cortex of the femur or tibia in the same patient, so the penetration is changed accordingly. It appears to us logical that a further interval of apparent good health should be obtained if close attention is given to this detail. Further report will be made of the cases so treated.

Since reviewing the case cited above in the *Lancet*, we have treated one case by applying x-ray to the osseous system, using a penetration of 180 to 200 kv. At the completion of the treatment of the osseous system, radium was applied to the spleen in the form of a 150 mg. radium pack, using two anterior portals at a 25 mm. skin distance with a filtration of 1 mm. lead plus 0.5 mm. brass. The total dosage was 3,000 mg. hr. over a period of two days.

The primary results have been prompt and brilliant. The time has been too short to determine whether or not the method is an improvement in therapy. If longer intervals of apparent good health are obtained it will be recorded as an advance. The advantage that appears at present is that the radiation can be better limited to the spleen, that it is given over a longer period of time, that it would conform to the Regaud theory in the treatment of malignancy, namely: that a small dose of radium given over a longer period of time is more efficient than a large amount for a shorter period, more cells being subjected to radiation at the time of cell division.

Our technic in the earlier cases (1914-1915) was necessarily to give so-called low voltage therapy, 80 to 120 kv. For the past eight or ten years we have used voltages of 160 to 200 kv. with filtration of 0.5 to 1 mm. of copper (dosage of 3 to 7 per cent of an erythema skin dose).

Our observation of the twenty-seven cases treated with both voltages is that a more constant, prompt response is noted where the

higher voltage is used, and that the interval between treatments is much longer. A few cases have been treated by x-raying the spleen alone and we have noted a prompt response, though relapses are more frequent. We believe it is better to treat the osseous system, the primary seat of the disease, rather than to treat the spleen, thereby obtaining results in an indirect way as referred to elsewhere.

Anatomically, we treat the right leg laterally superimposed upon the left, then, in succession, the right thigh laterally, the right side of the chest, left leg, left thigh, pelvis, left side of the chest, then the arms and forearms folded upon the chest. The spleen is given small doses if it is very large or painful. Usually treatment of the spleen is reserved until all of the osseous system has been treated. Frequently the spleen never receives direct treatment.

The reasons for using the high voltages are quite logical. The bone marrow is the site of the disease and it is protected by the cortex. In the higher voltages a more penetrating or hard ray will reach the medulla, the cortex being penetrated.

CASE REPORTS

Case 1.—The clinical diagnosis was myeloid leukemia; the final diagnosis, lymphatic leukemia.

A woman, age 66, consulted her physician in 1930 on account of an abdominal tumor in the upper left abdomen. She was referred to an excellent surgeon, who made a clinical diagnosis of myeloid leukemia. The first blood examination was reported as myeloid leukemia. Without a blood examination I am sure that most of us would have made the same diagnosis.

The patient was well developed and fairly well nourished. The teeth were in poor condition, the mouth insanitary. The chest was negative.

The abdomen presented a tumor in the upper left quadrant quite characteristic of an enlarged spleen. The splenic notch was easily identified. The mesial margin was at the midline. The inferior margin was on a level with the umbilicus. The only palpable lymph nodes were the left inguinal, which were quite small.

Blood examination a few days after admission to the hospital revealed a chronic lymphatic leukemia. The small lymphocytes were numerous (80 per cent); white cells 34,200; red cells 4,250,000; polynuclears 20 per cent.

The entire osseous system was treated with x-ray before a second blood examination revealed chronic lymphatic leukemia. The treatment included a few applications to the spleen. In one month the lymph nodes were barely palpable, and the spleen was palpable, showing a few nodules in the mesial margin.

Enlarged lymph nodes appeared in the neck one month after treatment, and the mild enlargement of the spleen was a rather persistent feature. Treatments were given in 1930 and repeated in January, April and October, 1931, in April and May, 1932, and in April, 1933.

In April, 1933, there was mild fibrosis of the lymph nodes of the right side of the neck. The spleen was palpable, very small, though slightly nodular. These changes are present to date. No lymph nodes are palpable. The patient remains free of symptoms or signs except a small nodular spleen that is palpable.

Several teeth were involved in apical abscesses. They were not removed until seven months after treatment was begun, for fear that bleeding might be uncontrollable, as it frequently is following surgery when anemia is present. In our experience disaster has occurred on two occasions from uncontrollable hemorrhage after extraction of teeth in acute lymphatic leukemia. This is particularly true in acute leukemia and any surgery should be delayed until there is definite evidence of convalescence or improvement.

This case is of interest, first, because of error in clinical diagnosis; second, because lymphatic leukemia beginning in the spleen is quite rare; and lastly, because the patient is free of symptoms three years after treatment. As a rule, lymphatic leukemia occurring primarily in the spleen runs a rapid course, frequently is fatal in six to twelve months.

Case 2.—The diagnosis was myeloid leukemia. The patient consulted her physician on account of an abdominal tumor. She was treated with iron and arsenic for two months, the disease progressing during treatment. We saw her in February, 1915, four or six months after the first symptoms, at which time she was having pain in the spleen and was so weak and anemic that it was difficult for her to come to the office for treatment.

The spleen practically filled the abdominal cavity. The appearance of the abdomen was that of a full-term pregnancy. The white cell count was 1,000,000.

Treatment to the entire osseous system was given, using 120 kv. with 4 to 6 millimeters of aluminium filter. Her improvement was rapid and remarkable. The first treatment was begun in February, 1915, and on November 27, 1915, Thanksgiving Day, she gave birth to a full-term male child, well developed. Two lower incisor teeth were erupted at birth. It is quite unusual for pregnancy to develop during the course of a myeloid leukemia, and it is reported that frequently the child will die of leukemia in the first few months of his or her life. This boy is now eighteen years of age, a senior in high school, a member of the track team.

The patient lived five and one-half years, enjoying excellent health for the greater part of five years, fair health for three years, and dying of anemia, the usual termination unless some intercurrent disease intervenes.

During this time she occasionally received a series of x-ray treatments, responding quickly until the last two years of her life, when response was slow, and finally, no response to treatment was noted. The patient succumbed in a short while after the anemia began.

I am sure her life was extended and there is no

doubt that her comfort and usefulness were made possible by roentgen therapy. Can anyone doubt the efficiency of radiation treatment after observing this patient?

Case 3.—The diagnosis was myeloid leukemia.

A man, age 62, was first seen by us in September, 1926. His illness began two months previously. The first symptom was diarrhea that was quite profuse and persistent. Two weeks previous to admission an eruption of the skin occurred along the course of the intercostal nerves that was diagnosed as herpes. The patient, while observing the eruption, discovered an abdominal tumor in the left upper quadrant. The blood count was red cells 4,560,000; white cells 34,000; hemoglobin 78 per cent; myelocytes 6 per cent.

He was given high voltage highly filtered x-ray therapy, 160 to 200 kv., to the entire osseous system. Response was prompt, the patient gaining 17 pounds in weight the first month. The herpes and diarrhea were arrested promptly. Blood examinations were made at monthly intervals and no treatment was indicated for fourteen months.

The red count then was 4,880,000; white count 26,600. Myelocytes were 3 per cent, and hemoglobin was 70 per cent. Another radiation of the entire osseous system was given and no further treatment was indicated for 15 months. The intervals between treatments were much longer than any that we have experienced in which low voltage therapy was used. Two winters were spent in California by this patient.

Following the second series, thirteen months of good health were experienced. He did not report for treatment again for six months and during the next three years he received treatments every six or seven months. For the past three years he has received treatment at intervals of three to five months.

He is alive now, more than 7 years after the treatment was begun, but he will soon succumb to the disease unless he succumbs to one of his attacks of myocarditis that have been frequent during the past two years.

A study of the blood counts and the changes after treatment are of interest.

September 26, 1926, the blood count was:

Hemoglobin	78 per cent	White cells	34,000
Red cells	4,560,000	Myelocytes	6 per cent

A series of x-ray treatments was given October 1-9, 1926. The blood count October 8, 1926, was:

Hemoglobin	80 per cent	White cells	11,200
Red cells	4,800,000	Myelocytes	0

Blood count, November 10, 1926, was:

Hemoglobin	80 per cent	White cells	10,600
Red cells	4,890,000	Myelocytes	0

Clinically his improvement was rapid with a gain in weight of 17 pounds. On November 17, 1927, his blood count was:

Hemoglobin	90 per cent	White cells	26,600
Red cells	4,880,000	Myelocytes	3 per cent

A series of x-ray treatments was given November 18-23, 1927. Blood count, December 15, 1927, was:

Hemoglobin		White cells	3,000
Red cells	4,160,000	Myelocytes	0

Improvement was prompt. He gained 12 pounds in weight. No further treatment was given until February 11, 1929. Blood count then was:

Hemoglobin	75 per cent	White cells	21,000
Red cells	4,300,000	Myelocytes	3 per cent

A series of x-ray treatments was given February 11-20, 1929. His blood count on April 6, 1929, was:

Hemoglobin	70 per cent	White cells	10,000
Red cells	4,780,000	Myelocytes	0

A series of x-ray treatments was given September 23-27, 1929. His last blood count was made April 11, 1933.

Hemoglobin	60 per cent	White cells	61,000
Red cells	3,290,000	Myelocytes	29 per cent

Case 4.—A woman, age 32, whose father and mother are both living, has two children, ages thirteen years and three years.

She had not been well since the birth of her last child. She first noticed shortness of breath one year previously, accompanied by pain in the left shoulder. She first noticed heaviness in the left side one month before. Gastric distress and pain in the legs and muscles had been present two or three weeks. These symptoms were the result of anemia.

Examination shows a well developed, poorly nourished anemic woman. The spleen is easily identified, the mesial margin is to the right of the median line, the inferior margin is three inches below the level of the umbilicus. The spleen is tender and painful on pressure.

The blood count shows hemoglobin 65 per cent; white blood cells 180,000; red blood cells 3,800,000; myelocytes 16 per cent.

High voltage x-ray (200 kv.) was applied to the entire osseous system. Applications were given daily from July 15 to July 25, 1933, inclusive. On July 21 and 23 radium was applied to the spleen in the form of a 150 mg. radium pack through two anterior portals at a distance of 27 mm., filters of 0.5 brass and 2 mm. lead, time 20 hours.

Response to treatment was prompt and brilliant, as the following blood examinations reveal:

1933	Per Cent Hemoglobin	Red Cells	White Cells	Per Cent Myelocytes
Aug. 21	60	3,750,000	12,800	3
Oct. 12	65	4,700,000	9,400	4
Nov. 13	75	5,150,000	12,200	1

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DISCUSSION (*Abstract*)

Dr. J. T. McKinney, Roanoke, Va.—While it is generally known by roentgenologists that x-ray and radiation therapy are our most useful agents in the treatment of leukemias of the chronic type, this information is not widely disseminated among the other groups of practitioners. In the acute leukemias, as brought out by Dr. Keith, very little can be accomplished by any

method of treatment, the course of the disease usually being rapidly fatal.

It has been my custom for a number of years, in keeping with radiologists in general, to treat the chronic lymphatic leukemias of the myelogenous or splenic types with the lower voltages at first, gradually increasing the kilovoltage as indicated by the results of treatment in each individual case. With this method I have carried several cases of the myelogenous type along in comparative good health for a period of from eight to ten years. However, I have had no case live longer than ten years with any method of treatment.

We have one case now under observation of the myelogenous type in which the spleen was of enormous size, extending well beyond the mid-line towards the right side, and about two inches below the crest of the ilium in the vertical diameter, which has been under treatment for the past three years. The blood count at the beginning of treatment was 555,000 whites; 45 myelocytes and 2,853,000 reds. This patient has been given treatment with voltages ranging from 120,000 to 160,000 kv. His blood picture has been kept at approximately 75,000 to 85,000 whites, 3 to 5 myelocytes and 4,500,000 reds per cu. mm. Treatments have been given at intervals of from four to six months, and his general health and well being have been satisfactory. He feels better with a white count around 75,000 than when his count is around 20,000 to 22,000.

In several cases of the myelogenous type we have used the intravenous introduction of thorium dioxide (thorotrast) to outline more accurately the size of the liver and spleen, and while some slight reactions have been reported, we have had no unfavorable reactions in our series.

We usually treat the skeletal system as outlined by Dr. Keith and give treatments directly over the spleen. As was brought out by Dr. Jenkinson, of Chicago, several years ago, we have also given treatments over the chest and heart. However, in our experience there has been more reaction following treatments given directly over the chest and heart than directly over the spleen and long bones.

Dr. Keith's suggestion that we begin treatment with the higher voltage, with the results obtained in his reported cases, would certainly warrant a trial of his method, and I expect to adopt it.

THE RATIONAL TREATMENT OF HYPERTHYROIDISM*

By JOHN DEJ. PEMBERTON, M.D.,
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Since current medical literature shows that many opinions exist regarding the best treatment of hyperthyroidism, it seems timely to review the present status of our knowledge of hyperthyroidism, as well as the principles and problems underlying any rational treatment of this condition. The term "hyperthyroidism" embraces two diseases, exophthalmic goiter and adenomatous goiter with hyperthyroidism, and since there are important differences, I shall consider them separately.

Although the cause of exophthalmic goiter is not known, all evidence indicates that an intense stimulus of unknown source, acting on the entire thyroid gland, drives the gland to the point of diffuse hypertrophy. This results in the excessive production of its active agent which, in the tissues of the body, causes all the phenomena of the disease. These phenomena may be divided into two groups: (1) cardiovascular changes, intolerance to heat, increased appetite, loss of weight and weakness, which are the manifestations of increased metabolism or oxidation processes, and which can be produced experimentally in the normal or myxedematous patient by repeated injections of thyroxine; and (2) the nervous syndrome, ocular changes, and gastro-intestinal crises of nausea and vomiting, symptoms which in contrast to those of adenomatous goiter with hyperthyroidism are distinctive of exophthalmic goiter, but which cannot be produced experimentally. As the nervous syndrome, gastro-intestinal symptoms and, in many instances, the ocular changes, as well as all evidence of increased metabolism, disappear after partial thyroidectomy, H. S. Plummer conceived the hypothesis that the hypertrophic thyroid gland secretes two products, a normal and an abnormal agent, and that the syndrome of the disease varies according to the total amount of the normal, and with the relative amount of the two products in the tissues. The fact that the symptoms peculiar to exophthalmic goiter will disappear or diminish in intensity under the administration of compound solution of iodine, while the basal metabolic rate remains elevated, and the fact that these symptoms may be present in cases in which basal metabolic rates are normal, are corroborative evidence of this hypothesis.

To determine the effect of any type of treatment it is essential to consider the natural course of the disease. From the histories of patients with exophthalmic goiter, it is apparent that in a large proportion of cases the disease proceeds in waves of increased intensity with intervening periods of partial, and sometimes of complete remission. This fluctuating course is more pronounced in the first twelve to eighteen months, for, as the enlargement of the thyroid gland increases and the gland becomes firmer in consistence, the course of the disease tends to be-

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*From the Section on Surgery, The Mayo Clinic.

come more even. It is well known that occasionally patients with exophthalmic goiter, after a relatively brief course, will be completely and spontaneously cured, sometimes remaining entirely free of any residual effects of the disease. In other cases, after a long protracted course, the hyperthyroidism subsides, but in the meantime the patients have become permanently invalided because of the development of irreparable degeneration, especially of the heart and liver. It is also well known that a certain proportion of patients who are untreated will die during the height of an exacerbation of profound hyperthyroidism, or frequently of acute infectious diseases to which the state of crisis seems to increase susceptibility or of causes directly attributed to circulatory complications. The true natural course is not known. To obtain this information it would be necessary to study the records of a series of untreated patients with exophthalmic goiter over a period of many years.

The nearest approach to such an investigation were the studies of Kessel, Lieb and Hyman, who reported the progress of a series of fifty-one patients who did not receive treatment other than iodine and supportive measures, such as rest, sedatives and diet high in calories. Although they recorded marked improvement of a large proportion of the patients, it is interesting to note that twenty-two months after the first of these patients had been under observation, five patients (10 per cent) had died.

A more recent report has been made by Fraser. In 1930 he examined or received reliable reports from twenty-six patients with exophthalmic goiter who had been under his care in St. Bartholomew's Hospital during 1920 to 1925. Ten of these were treated by partial thyroidectomy and sixteen by means other than surgery or irradiation. Although the two groups were not strictly comparable, since surgical measures were advised in the more severe cases and in those that proved resistant to medical measures, nevertheless they serve to illustrate the comparative effects of the two methods of treatment. Although Fraser estimated the late results as "good" in eight (50 per cent) of the group treated by medical measures, and in eight (80 per cent) of the group treated by surgical measures it is significant that after the lapse of five to ten years, four (25 per cent) of the former, and only one (10 per cent) of the latter had died.

Since it is natural for patients with exophthalmic goiter to seek medical advice during a cycle of intensity of this disease, rather than during an intervening period of remission, it is obvious that this fact must be taken into account before the effect of treatment can be determined accurately. During the period of early development of surgery in this field, when the operative hazards were great and when the fluctuating course of the disease was not generally recognized, there were ardent advocates of many different systems of treatment for exophthalmic goiter, such as: the rest cure, treatment with "specific" serums, or "specific" drugs, irradiation, injections and various other forms of therapy. Exorbitant claims regarding the effect of treatment were made by the supporters of each. For the most part these claims were made in good faith, the natural improvement in symptoms being misinterpreted as the effect of the treatment. However, in spite of the fact that the progress of surgical treatment of the thyroid gland was difficult and impeded by many obstacles, such as the high mortality rate, the occurrence of postoperative reactions, the need for multiple operations, and the large percentage of patients who were poor surgical risks, great advances were made in this form of treatment. As these results became more widely known among the medical profession and the laity it became generally recognized that surgery offered the patient with exophthalmic goiter the best chance for recovery, and in consequence many of the other methods of treatment were soon discarded.

Until the cause of the disease is discovered, and a specific therapeutic agent is found to combat the cause, it is apparent that there is no ideal form of treatment. However, in the light of our present knowledge gained from clinical, pathologic, chemical and physiologic investigations, the only rational method of attack consists in the employment of measures to reduce the activity of the thyroid gland, supplemented by supportive and protective measures. The frequency with which overwork, mental and emotional stresses and infections are associated with the apparent onset of the disease, is strong presumptive evidence that they are predisposing etiologic factors, and it is generally conceded that no method of attack on the thyroid gland that is not supplemented by measures to eliminate these factors will obtain the maximal beneficial results.

The three measures most commonly employed in the endeavor to reduce the activity of exophthalmic goiter are: (1) administration of iodine, (2) irradiation, and (3) operation.

The effect of the administration of iodine on the histologic structure of the thyroid gland in exophthalmic goiter is too well known to require elaborate discussion. It is necessary only to call to mind the investigations of Marine, Broders, Sager, Rienhoff, Cattell and others who demonstrated that in many cases after the ad-

ministration of iodine marked involutional changes occurred in the hypertrophic gland characterized chiefly by: (1) flattening of the epithelial cells; (2) increased accumulation and staining property of the colloid; (3) apparent increase in the size of the follicles with diminution in number and size of the papillary infoldings, and (4) decrease in vascularity and lymphocytic infiltration. Likewise, the early effect of administration of iodine on manifestations of the disease is so universally recognized that it is necessary only to point out that the most pronounced effect is observed in the disappearance or diminution of the nervous and gastrointestinal manifestations of the disease. Although the intensity of the hyperthyroidism is generally reduced, the reduction is not constant. Boothby found that the metabolism is markedly reduced in about a third of the cases, is somewhat less markedly affected in another third, and in the remainder no demonstrable effect on the metabolism is produced. Because of this marked immediate improvement, the question naturally arises regarding the effect of prolonged administration of iodine on the course of the disease. A positive answer to this cannot be given; I do not know of any study of a series of consecutive patients treated by iodine alone, unless it is the series of Kessel, Lieb and Hyman, whose patients received syrup of ferrous iodide. However, as I have seen many patients with marked persistent hyperthyroidism who have taken compound solution of iodine for a year or longer, it is my belief that iodine offers little hope, except in occasional cases, of producing any permanent beneficial effect on the course of the disease.

The employment of irradiation in the treatment of exophthalmic goiter is based on the conception that the hypertrophic parenchymatous cells of the thyroid gland, as well as the lymphocytic infiltration commonly associated with the histologic changes found in this disease, are peculiarly radiosensitive, while the normal cells are peculiarly radioresistant. The functional activity can thereby be diminished without destruction of structure. Experimental proof is lacking that involutional changes occur in the thyroid gland of exophthalmic goiter after irradiation, for the difficulties of obtaining specimens from patients with exophthalmic goiter before and after irradiation are obvious. However, in a series of 4,061 patients with exophthalmic goiter operated on in The Mayo Clinic in 1926 to 1928, inclusive, the records show that 291 (5 per cent) had had previous treatment with irradiation. At operation only occasionally could the surgeon recognize any gross changes in the gland itself to indicate that it had been irradiated, and Broders was unable from microscopic study to distinguish the irradiated tissue from tissue that had not been irradiated. Because irradiation in dosage below that sufficient to produce injury of the skin will diminish or cause complete cessation of function of other glandular structures such as the testes, ovaries and salivary glands, it is reasonable to assume that it has a similar effect on the hypertrophic gland in exophthalmic goiter. Furthermore, reduction of metabolism, as well as amelioration of symptoms of the disease, which, in a certain proportion of cases, follows irradiation of the gland, furnishes suggestive evidence that the functional activity of the gland is diminished as a result of irradiation. However, the degree in which the hyperactivity of the gland can be diminished by repeated irradiation and the proportion of cases in which the treatment does not cause apparent improvement are points of contention among those who have had the opportunity of studying the effects of this form of treatment. In the literature there is no dearth of articles on the subject. There are observers, for the most part radiologists, who claim extravagant results by irradiation, and others, chiefly surgeons, who deny that irradiation has any beneficial effect on the course of the disease. With few exceptions, these claims and denials are not supported by sufficient factual data to be convincing. Since interpretations of therapeutic results of treatment, unless supported by adequate data, are likely to be greatly influenced by the bias of the individual author, many of these articles must be considered as expressions of opinion rather than as presentations of facts. The notable exceptions are the publications from the Massachusetts General Hospital. These comprise two reports by members of the committee organized to investigate the relative merits and limitations of the surgical and roentgenologic treatment of toxic goiter. As the committee was composed of members of the medical, surgical and roentgen ray staff, interpretations of results and conclusions must be considered relatively free of bias. In the first paper, in 1923, in which are submitted comprehensive data regarding sixty-seven cases of toxic goiter treated by roentgen rays, Means and Holmes noted either recovery or improvement coincident with the treatment of two-thirds of the patients with exophthalmic goiter. The remaining third neither improved nor grew worse. One

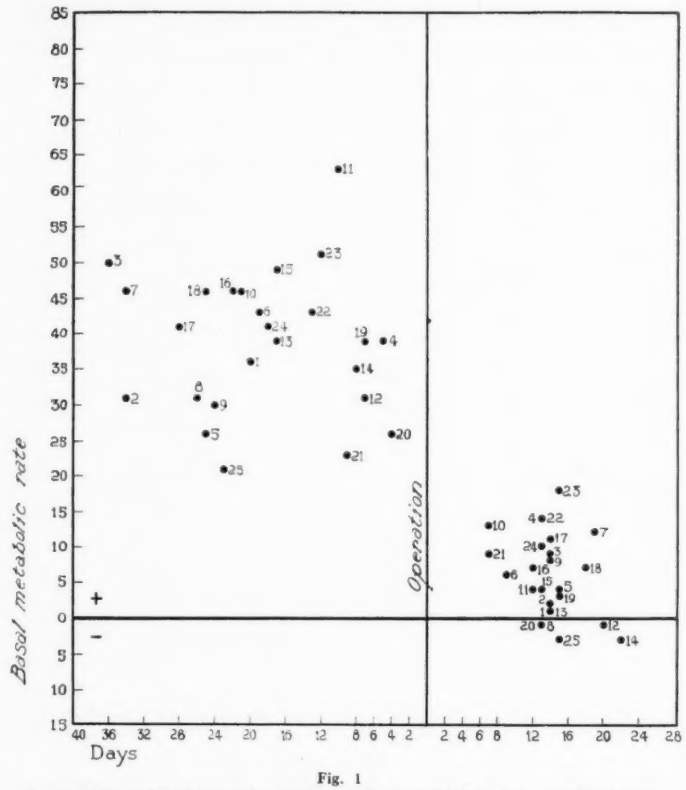

Fig. 1

A consecutive series of twenty-five patients with exophthalmic goiter. Basal metabolic rates were determined before and after operation. The patients had not received iodine.

of their conclusions was their belief that the roentgen rays probably have a beneficial effect in cases of toxic goiter. It should be noted that these investigations were completed about the time that H. S. Plummer established the value of the administration of iodine to patients with exophthalmic goiter under preparation for operation. After recognition of the value of iodine in reducing the operative mortality among patients with exophthalmic goiter, a paper was published by all the members of the committee of the Massachusetts General Hospital in which they compared the results of irradiation with those of surgery, and concluded that iodization followed by subtotal thyroidectomy is the best treatment of exophthalmic goiter. It is significant that the conclusion reached by this group of internists, surgeons and radiologists, namely, that surgery offers the best results in the treatment of exophthalmic goiter, tallies with the conclusions of similar groups of observers who have had wide experience in the care of patients with this disease. In The Mayo Clinic, irradiation has been employed in selected cases of exophthalmic goiter for many years, in fact C. H. Mayo was one of the first in the country to advocate its use. It has been employed as a preoperative measure in selected cases considered poor surgical risks, and in some instances in cases of postoperative recurrence of hyperthyroidism. In a small proportion of the cases, improvement has followed treatment, whereas in the others no change in the severity of the hyperthyroidism could be detected. Since the administration of iodine has proved superior as a preoperative preparatory method, irradiation has not been used in recent years except occasionally in a very small group of cases refractory to iodine. In these, the results have not been encouraging.

Since the preoperative preparation of patients with exophthalmic goiter became standardized, primary subtotal thyroidectomy has been performed on 96 to 98 per cent of such patients admitted to The Mayo Clinic. For the remaining 2 to 4 per cent, owing to the severity of the disease or the condition of the patient, partial resection of the goiter was preceded by ligation of the superior thyroid vessels, or the operation was performed in two stages. Since the operation consists of the removal of a definite mass (by weight) of thyroid tissue, representing, in my practice, about 65 to 90 per cent of the total weight, it is apparent that the functional activity of the gland is thereby at least temporarily reduced. The changes in the immediate course of the disease following operation, as evidenced by abatement of symptoms and reduction of metabolism, commonly to normal values within two to four weeks, are so striking as to leave

no reasonable doubt of the effect of the operation on the course of the disease. The marked decrease in the basal metabolic rate after operation is so prompt and constant within seven to twenty-eight days after the operation (*Figs. 1* and *2*), that the spontaneous fluctuating course of the disease as a possible causal factor may be reasonably excluded, and since these changes were equally marked in cases in which iodine was not given, this factor may also be definitely excluded. Obviously, then, these changes clearly indicate only one factor: the effect of the operation.

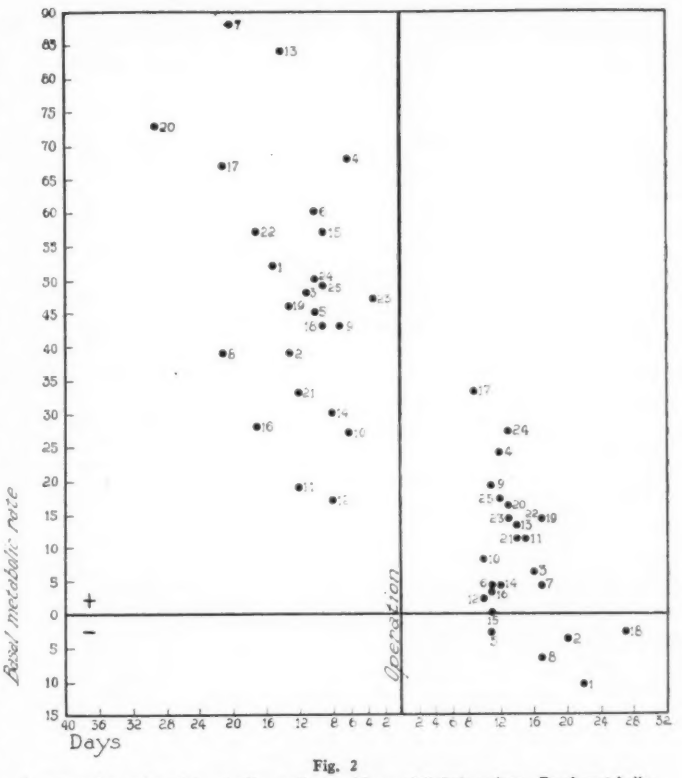

Fig. 2

A consecutive series of twenty-five patients with exophthalmic goiter. Basal metabolic rates were determined before and after operation. The patients had received iodine.

Accurate determination of the late results of treatment of the disease is not possible except by the frequent examination over a period of years of all patients in a series. Such examinations should comprise the determination of accurate metabolic rates and a check-up of the patient's physical condition by an internist trained in this field. Although an opportunity has been afforded to determine the efficacy of the surgical treatment of many hundreds of patients on whom subtotal thyroidectomy had previously been performed in The Mayo Clinic, and who have returned for check-up or treatment for other conditions, it is not possible to meet the foregoing requirements in any consecutive series. Consequently, the only available method of estimating the late results in any stated series of cases is by means of questionnaires. In October, 1932, questionnaires were mailed to three series of patients, that is, the first 150 patients with exophthalmic goiter who were operated upon in the years 1927, 1929 and 1931. The diagnosis of exophthalmic goiter had been confirmed in each case by the finding of diffuse parenchymatous hypertrophy of the thyroid gland by pathologists. Data were compiled from the first 100 answers of each series (*Table 1*). No attempt was made to grade the results by interpretation of the answers. The classification shown in the table represents the patient's own opinion of his or her present condition. Although these have some significance, due allowance should be made, for obviously there are many factors unrelated to the disease or treatment which may influence the patient's own classification of the condition. However, the decrease in the pulse rate and the gain in weight after treatment, both measurable factors, are certainly suggestive evidence of the amelioration of the hyperthyroidism. As the differences in the average pulse rate and the differences in the average weight, preoperatively and postoperatively, in all three series are almost identical with those of a series reported by Clute, in which five years after operation the average basal metabolic rate was normal, it is not unreasonable to assume that the average rates in these series would be within the range of normal.

Table 1

RESULTS

	Exophthalmic Goiter		
	1927	1929	1931
Patients	100	100	100
Improved	*65	*67	75
As well as before onset of disease	33	29	21
Same as before treatment			2
Worse after treatment	†1	†1	2
Dead	1	3	
Material Studied			
Average age males, years	42.35	42.94	44.67
Average age females, years	38.86	40.75	40.48
Average age group, years	39.95	41.59	42.16
Average basal metabolic rate before operation	+52.80	+47.80	+42.40
Average duration hyperthyroidism before operation, months	15.60	11.27	17.20
Average pulse before operation	122	117.46	115.35
Average pulse after operation	77	76.85	76.46
Average weight (pounds) before operation	128	130.45	139.86
Average weight (pounds) after operation	155	155.21	160.29
Average time after operation before patient received maximal benefit, months	11.88	9.44	8.47
Males	31	38	40
Females	69	62	60

*Two recurrences (2 per cent)
†Myxedema

Of the 300 patients first heard from in the three series, four (*Table 2*) (1.33 per cent) have died. Two died from causes unrelated to the disease or treatment. One patient, aged sixty-eight years, operated on in 1927, died about five years later from "heart failure," and the fourth, a man aged forty-eight years, with recurrent exophthalmic goiter, died as a result of hypertension.

There are two principal hazards in operating for exophthalmic goiter: the severity of the hyperthyroidism and the presence of visceral degeneration. The former has been largely eliminated by the preoperative preparation with iodine, and the latter is being controlled by the tendency of the patient to seek operation sooner after the onset of the disease. Thus, in the last nine years, 1924 to 1932, partial thyroidectomy was performed on 8,425 patients with exophthalmic goiter. Seventy died, an operative mortality of 0.83 per cent.

Table 2

MORTALITY FROM EXOPHTHALMIC GOITER

Age, Sex	Complications	Date of Death	Cause of Death
	1927		
68M	Auricular fibrillation	11-2-31	Heart failure
	1929		
62M	Essential hypertension; right renal stone	31	Not stated
48M	Recurrent exophthalmic goiter (first operation elsewhere 1927)	Not given	High blood pressure and hardening of arteries
36F	First operation 3-16-29; returned 9-2-29 with mild recurrence	10-21-32	Operation elsewhere for carcinoma of ovary

Five patients are known to have had recurrence of hyperthyroidism: four of these returned to the clinic for a second operation, and later, in reply to questionnaires, reported their condition as improved. The fifth patient had a second operation elsewhere and subsequently died from "cancer of the ovary." This tendency for hyperthyroidism to persist at reduced intensity or to recur in a small proportion of cases after subtotal thyroidectomy has been the basis of the objections regarding the efficacy of this form of treatment. No claim is made that resection of the thyroid gland will remove the underlying forces which cause the disease, for it is appreciated that these do not originate in the gland. However, both the clinical manifestations of complete recovery and the involutional changes in the remnant of thyroid tissue of patients who have been freed of the disease, produce convincing evidence that in a high percentage of cases resection of the thyroid gland in cases of exophthalmic goiter accomplishes more than mere reduction of glandular secretion by removing the excessive thyroid tissue. It is also strongly suggested that resection of the thyroid gland, with resulting rapid relief of hyperthyroidism, breaks an important link in the unknown chain of etiologic factors in the disease and that, thereby, readjustment to normal in the physiology of the thyroid gland, as well as in that of other organs, is permitted. If this were not true, in view of the known regenerative property of the thyroid gland, it would be reasonable to expect immediate recurrence of manifestations of the disease after every operation in which any viable thyroid tissue was preserved. In the light of our present knowledge of the disease, therefore, it is my opinion that recurrence of hyperthyroidism after subtotal thyroidectomy should not be looked on as failure in the sense that this form of treatment is not rational, but that recurrence of hyperthyroidism is a manifestation of the recurrence of the underlying forces that caused the disease originally.

Although the scope of this paper does not permit an exposition of the arguments in support of H. S. Plummer's conception that adenomatous goiter with hyperthyroidism is a separate clin-

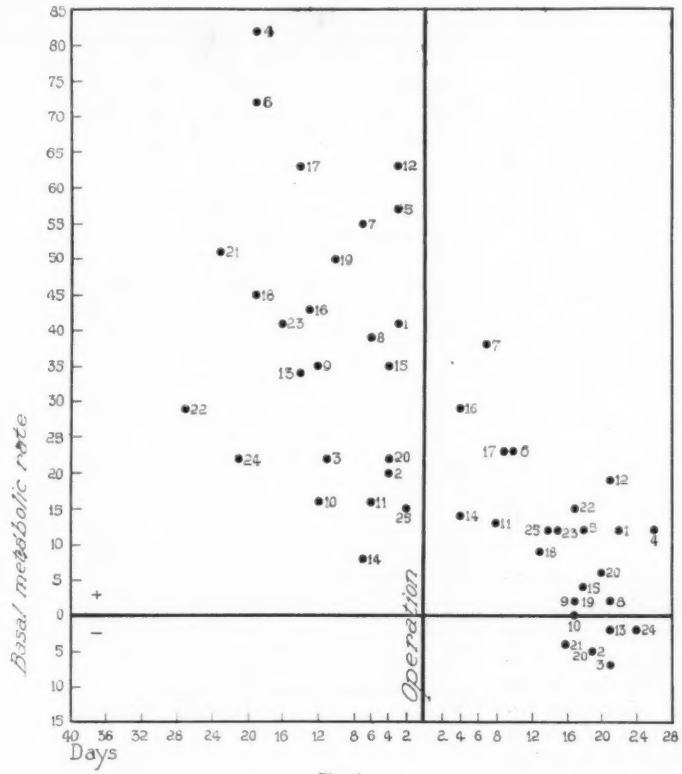

Fig. 3

An unselected series of twenty-five patients who had adenomatous goiter with hyperthyroidism. Basal metabolic rates were determined before and after operation. The patients had not received iodine.

ical entity from exophthalmic goiter, it is important, for a clear understanding of the problems of treatment, to recall that the cause of all the manifestations of the disease resides in the adenomatous or abnormal nodular tissue of the thyroid gland. Unlike the thyroid gland of exophthalmic goiter, which is diffusely hypertrophied, the gland in this disease may be affected only in part, and when the encapsulated or partially encapsulated nodule or nodules are removed, there follows within two to four weeks complete relief of symptoms of hyperthyroidism (*Fig. 3*). And since the tumors develop for the most part during the second and third decades of life, it is exceedingly uncommon after operation for new tumors to develop with reappearance of symptoms of hyperthyroidism. Most of the so-called recurrences are not recurrences in the sense of development of new tumors, but result from the subsequent growth of adenomas overlooked (at operation) by the surgeon.

It is apparent that surgery not only offers patients who have adenomatous goiter with hyperthyroidism the only certain means of cure, but it also removes abnormal tissue which has definite potentialities of developing into carcinoma. In a study of a series of 276 patients with carcinoma of the thyroid gland on whom operations were performed, I found unquestionable evidence that the malignancy originated in a preëxisting goiter in 239 (87 per cent). In addition the records of these 276 patients revealed that before operation only ninety-eight (35 per cent) were suspected of having carcinoma. Of the remaining 65 per cent, a preoperative diagnosis of benign adenoma was made. It will be seen, therefore, that it is not always possible to recognize the clinical manifestations of carcinoma of the thyroid gland in its early stages. Aside from the danger of the patient developing visceral degenerations because of prolonged hyperthyroidism, it is apparent that delay in the surgical removal of toxic adenoma is also attended by the definite risk that carcinoma will develop on a benign tumor or that carcinoma will spread from an adenoma whose malignant character was not suspected from the physical examination.

In an endeavor to determine the late results of surgery in cases of adenomatous goiter with hyperthyroidism, methods of obtaining and compiling data were employed identical to those described for exophthalmic goiter. It may be noted (*Table 3*) that the percentage of patients who considered their condition as "improved" or "as well as before onset of the disease" is somewhat less than among the patients with exophthalmic goiter. However, I feel certain that a general examination of such patients

Table 3

RESULTS

	Hyperfunctioning Adenomatous Goiter		
	1927	1929	1931
Patients	100	100	100
Improved	60	69	74
As well as before onset of disease	29	22	20
Same as before treatment		5	4
Worse after treatment	2	3	2
Dead	9	1	
Material Studied			
Average age males, years	48.08	47.47	56.63
Average age females, years	50.61	51.77	51.44
Average age group, years	50.03	50.87	52.02
Average basal metabolic rate before operation	+38.23	+29.50	+26.67
Average duration hyperthyroidism before operation, months	32.14	23.48	27.23
Average pulse before operation	108.72	107.63	105.64
Average pulse after operation	75.41	77.71	73.37
Average weight (pounds) before operation	139.08	138.17	137.40
Average weight (pounds) after operation	157.82	158.49	150.88
Average time after operation before patient received maximal benefit, months	11.78	10.57	9.20
Males	23	21	11
Females	77	79	89

would disclose that they were more completely relieved of hyperthyroidism than those with exophthalmic goiter. That factors other than hyperthyroidism influenced the answers to questionnaires is suggested by the fact that in the group of cases of adenomatous goiter with hyperthyroidism many complications (*Table 4*) were found on examination prior to operation. The high percentage of complications in this group, accounted for by the advanced age of many of the patients and the long duration of the hyperthyroidism, explains the higher operative and the later mortality. Thus, in the last nine years (1924 to 1932) partial thyroidectomy was performed on 3,543 patients with adenomatous goiter with hyperthyroidism; fifty-three died, an operative mortality of 1.49 per cent.

Of the ten patients who died at home subsequent to operation, seven (*Table 5*) had cardiovascular complications at the time of operation. Carcinoma was the cause of death of two patients, and one patient died following cholecystectomy performed elsewhere.

SUMMARY

Until the cause of exophthalmic goiter is known, and until a specific treatment is discovered to combat it, the only rational method of treatment consists in the employment of measures that will reduce the activity of the hypertrophic thyroid gland, supplemented by sup-

Table 5

MORTALITY FROM ADENOMATOUS GOITER WITH HYPERTHYROIDISM

Age, Sex	Complications	Date of Death	Cause of Death
	1927		
60F	Essential hypertension	5-30	Pneumonia
55F	Essential hypertension; tumor right lung; secondary anemia	6-13-28	Epilepsy
56F	Arteriosclerosis	8-30-32	Pneumonia
57F	Myocardial degeneration; auricular fibrillation	-29	Stroke
62F		7-8-32	Carcinoma of throat
52F	Myocardial degeneration; auricular fibrillation	10-8-30	Heart disease and complications
49F	Cardiac decompensation; essential hypertension	1-15-28	Sudden death with stroke
61F	Bronchiectasis; auricular fibrillation	3-5-32	Pneumonia
54M	Hypochlorhydria	9- -27	Carcinoma
	1929		
57F	Recurrent goiter; operation elsewhere 1926	6-17-30	Following cholecystectomy elsewhere

Table 4

COMPLICATIONS IN 300 CASES OF TOXIC ADENOMA
(1927-1929-1931)

Year	Hypertension	Murmurs	Arteriosclerosis	Myocardial Degeneration	Cardiac Hypertrophy	Congestive Heart Failure	Endocarditis	Angina Pectoris	Diabetes Mellitus	Total
1927	8	26	2	6	2	3	1	1	2	51
1929	14	29	8	3	5	2	5	1	2	69
1931	15	14	5	4	2	2			6	48
Total	37	69	15	13	9	7	6	2	10	168
Total percentage	12.33	23.0	5.0	4.33	3.0	2.33	2.0	0.66	3.33	56.0

portive and protective measures directed at the elimination of possible predisposing etiologic factors. Subtotal thyroidectomy has a pronounced beneficial effect on the immediate course of the disease, reducing the metabolism to normal limits within fourteen to twenty-eight days. After the lapse of one, three and five years following operation, more than 90 per cent of the patients report their condition as "improved" or "as well as before the onset of the disease." In a small percentage of patients who have had subtotal thyroidectomy, there is recurrence of hyperthyroidism subsequently. There is evidence to indicate that in a large proportion of these cases the hyperthyroidism is a manifestation of the recurrence of the cause of the disease, rather than of the persistence of the disease. Due chiefly to the standardization of the preoperative preparation of patients with exophthalmic goiter, and to the fact that operations are being performed earlier after the onset of the disease, the operative mortality has been reduced below 1 per cent. Unless it can be proven that any proposed treatment has a definite beneficial effect on the course of the disease, resulting in a very large proportion of patients with complete recovery, its indiscriminate or prolonged employment, because unassociated with any immediate risk, cannot be considered free of hazards; obviously improvement without complete relief of hyperthyroidism eventually will lead to irreparable hepatic and cardiovascular injury.

As the cause of the syndrome of adenomatous goiter with hyperthyroidism is confined to the abnormal nodules of the thyroid gland, cure of the disease is accomplished by the surgical removal of the nodules. The definite potentialities of adenoma of the thyroid gland to become malignant, afford additional reasons for their early removal. The operative mortality, as well as the late mortality in adenomatous goiter with hyperthyroidism (1.49 per cent), is higher than in exophthalmic goiter. This is accounted for by the more advanced age of the patients and by the longer duration of the disease before treatment.

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SYMPTOMS AND SIGNS REFERRED TO THE ABDOMEN THE RESULT OF DISORDERS ELSEWHERE*

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In this age of technocracy, with machines replacing human brawn and brain and so-called instruments of precision making diagnoses of far-reaching importance to our patients, it might not be amiss to remind some of those within reach of my voice that no instrument yet made nor any test yet devised is capable of replacing clinical acumen, judgment and experience in arriving at a correct opinion of the various disorders presented by individuals who seek medical guidance. It is not my wish for anyone to assume that the importance of various laboratory procedures is not recognized and utilized; these adjuncts have a very good and deserving place in the diagnosis of disease, but anyone who relies too greatly on their help, to the exclusion of a careful study of the patient, his personality, his symptoms and his physical signs, will frequently be led far afield from the problem at hand.

To see a young, healthy, robust, athletically inclined youth condemned to a life of semi-invalidism because he has in his electrocardiogram a slight slurring of the Q R S is tragic. Because an appendix is not very freely movable

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when visualized by a roentgenologist or his technician, is not sufficient reason for its removal. Stereotyped opinions such as these are frequently given without utilizing either careful observation, precise thinking, or common sense reasoning. For these and other considerations, the title of this paper was suggested with the hope that it might, by directing attention to various extra-abdominal lesions causing symptoms and signs referred to the abdomen, lead, on the part of some, to a more careful study of the patient and greater effort toward the elucidation of his particular problem.

Impairment or derangement of the normal body function manifesting itself as a disagreeable sensation or as pain is usually the first symptom of disease. Pain, as defined in Webster's dictionary is

> "A form of consciousness characterized by desire to escape or avoidance and varying from slight uneasiness to extreme distress or torture; an affection or feeling proceeding from a derangement of functions, disease, or bodily injury."

Pain is usually the symptom which brings the patient to the physician; a careful study of its mechanism will frequently afford correct means for giving relief.

The meticulous observations and experiments of Ross, Head, Sherrington, McKenzie, Pavlov, Cannon and others have enabled us to understand in part the origin and effects of sensation, discomfort and referred pain through a more intimate and accurate knowledge of the workings of the autonomic nervous system. The intimate relationship existing between the cerebrospinal or voluntary nervous system and the autonomic or involuntary nervous system is well known. However, it is only within the past fifteen to twenty years that this relationship, its actions and interactions, has been generally appreciated and utilized in treating disease. The multiplicity of reflexes, difficult at times to explain or understand, is the reason for directing your attention to this problem.

The autonomic nervous system is composed of two divisions, the parasympathetic and the sympathetic; the parasympathetic is further divided into the cranial, which acts chiefly through the vagus, and the sacral division, which exercises control over a portion of the large bowel, the rectum, bladder and reproductive organs. The parasympathetic is concerned, according to Cannon, for individual organ effects and in the quiet building up of reserve fortifying the body against stress and the reproduction of the race. The sympathetic division, represented by the thoracico-lumbar segment, is the antagonist of the parasympathetic. The activity of this division is sudden and diffuse and serves, according to Cannon, the useful purpose of preserving the individual. Through the splanchnic and the white rami communicantes nerves, intimate relationship is established with the cerebrospinal system at various thoracic levels of the spinal cord and through the vagus with levels in the medulla and mid-brain. This close relationship makes possible numerous afferent and efferent pathways between the various organs and the cerebrospinal system and in turn from the cerebrospinal system to the skin, muscles and superficial blood vessels, establishing visceromotor and viscerosensory reflexes which are greatly concerned in any explanation of referred pain. In this connection the old viewpoint was that stimuli coming into the cord made that segment more sensitive and the sensation was merely "referred" to the corresponding skin or muscle segment. There is new evidence that the referred pain actually comes from the periphery as it may be relieved or made to disappear entirely with local anesthesia. From the studies of Weiss and Davis, Davis, Pollock and Stone, it seems that stimuli coming into the cord from a distended organ as the gallbladder, cause efferent reflexes to the periphery (possibly vasomotor), which in turn produce some unknown peripheral change which stimulates the sensory endings, causing painful impulses to travel back to the spinal cord. A disconcerting fact is that visceral painful impulses may travel up in the sympathetic chain, or along the vascular plexuses to a segment of the cord higher than usual. All stimuli capable of causing pain when applied to the cerebrospinal system will not produce pain when applied to the autonomic nervous system. Tension, undue contraction of smooth muscle, unphysiologic dilatation of a hollow viscus, or stretching of the capsule of an organ, together with physiochemical changes in the blood or body fluid, seem to be the effective stimuli producing reactions in the autonomic system causing the sensation of somatic pain. Mental states, such as fear, rage, depression and various affective disorders, influence the physiological activity of the autonomic nervous system either directly through descending pathways from the diencephalon or through the ductless glands, producing manifold visceral and somatic discomforts and pains.

The type of reflex and the intensity will depend on the psychic pattern of the person. In

one, an emotional insult will produce a visceral reaction, either unnoticed or soon forgotten, whereas the same stimulus applied to an individual with a different pattern will produce a distressing response. With such ideas in mind, the correct interpretation of the symptom of abdominal pain is not always simple or easy of explanation.

A young person who has always been in good health except for a few minor ailments is seen for the first time complaining of acute diffuse abdominal pain associated with nausea, vomiting, increased pulse rate and very slight, if any, elevation of the body temperature, or the pain may be more intense so that he twists, turns, and groans. On examination there is diffuse general abdominal tenderness with muscular rigidity, the rigidity being more marked toward the lower right quadrant than elsewhere; the leucocyte count is elevated with an increase in the percentage of polymorphonuclears—a classical picture of acute appendicitis and such a diagnosis most frequently is correct. The symptoms and signs are caused by viscerosensory and visceromotor reflexes originating from tension of the smooth muscle of the appendix and referred to the abdominal wall through some of the pathways previously described. On the other hand, this same classical picture may be simulated by other conditions which are quite familiar to all of you. As to just how and why such a reaction simulating an acute surgical emergency should occur in pathological extra-abdominal conditions cannot always be explained satisfactorily. Many years ago a patient with all of the above symptoms was seen; he had intense nausea which had lasted for twenty-four hours, severe abdominal pain and a board-like abdominal wall, the leucocyte count was high, there was a marked odor of acetone to the breath, the urine was heavy with sugar, acetone and diacetic acid. The differential diagnosis was between impending diabetic coma as a cause of the abdominal pain and an acute abdominal disease (appendicitis or perforating peptic ulcer) which precipitated coma in a diabetic. He was actively treated for the diabetic acidosis and with its subsidence the abdominal symptoms disappeared.

Walsh and Morgan have recently directed attention to a series of twenty-nine cases of poisoning from the bite of *Latrodectus mactans* (the black widow spider). The outstanding complaint of these patients is acute severe abdominal pain associated with marked to intense muscular rigidity, leucocytosis and occasionally fever. So clearly does the clinical picture resemble an acute surgical emergency that some of these individuals have had exploratory laparotomies.

The association of abdominal crises in patients with migraine is seldom mentioned. Blitzsten and Brams report ten cases characterized by severe, boring epigastric pain without relief from food, alkalies, nausea or vomiting. There is slight muscular rigidity in the epigastrium, no fever. During the attacks of abdominal pain, which may last from one to four days, the hemicrania disappears. Five of these patients had abdominal operations without finding anything abnormal. The diagnosis can be made from the history and the character of the attacks. Stevenson reports three cases of epidemic encephalitis in which abdominal pain simulating an acute surgical lesion was suspected. The correct diagnosis was subsequently made of encephalitis by the appearance of diplopia, myoclonus, widespread hyperesthesia and lethargy.

Among other conditions and diseases with which you are familiar as causing acute pain referred to the abdomen, I wish to mention pneumonia, diaphragmatic pleurisy, pericarditis, herpes zoster; with the onset of some of the acute infectious diseases, scarlet fever, measles, mumps, typhoid fever, rheumatic fever, influenza. Within the past few weeks a patient was seen in consultation with an excellent surgeon who had made a diagnosis of acute cholecystitis because of acute pain, tenderness and muscle rigidity in the upper right abdominal quadrant, with nausea, vomiting, chills, fever, increased pulse rate. The leucocytes were diminished. Within twenty-four hours the typical maculopapular rash of typhus fever was found.

Chronic poisoning with such substances as lead, arsenic, mercury and emetine during treatment for amebic dysentery may give referred pain. A patient who was about to undergo surgical treatment for an acute ruptured peptic ulcer was saved from such a catastrophe when an alert house officer observed a distinct lead line on his gums. The referred pain of Potts disease and the abdominal crises seen in tabes dorsalis are too well known to need any further description. An interesting group of cases to which attention was first directed by the late Sir William Osler includes Henoch's purpura, angioneurotic edema, urticaria and other allergic states in which abdominal pain with or without skin manifestations may be the most striking symptom. Arteriosclerosis, atheromatosis,

thrombo-angiitis obliterans, angina pectoris and sudden occlusion of a coronary artery furnish examples of abdominal pain which are very often extremely difficult to diagnose correctly. Other conditions such as septicemia, bacterial endocarditis, pyelitis, pyelonephritis, renal and ureteral calculus will only be mentioned.

Patients who have chronic abdominal pain always present interesting diagnostic problems which require time, patience and clinical judgment on the part of the physician for their correct solution. Discussions concerning the etiological factors involved in the causation of this great group of disabilities frequently produce certain reflexes, vasomotor, pilomotor and loquacious types of response among physicians, whether they be internists, gastro-enterologists, psychiatrists or surgeons. No attempt will be made either to stimulate or inhibit such reflexes among you. Since this group of patients far outnumbers any other group which comes for relief, some of them having submitted to one or more operative interventions without relief, others contemplating operative intervention because of self-made diagnoses, and a few others who have not formulated such opinions but seek relief, it is worth while to mention some of the abnormal states producing chronic pain or discomfort.

Certain diseases of the central system such as syphilis, transverse myelitis, either primary or metastatic tumors of the spinal cord and its coverings, infiltrating tumors as in lymphoblastoma, osteo-arthritis of the spine, tuberculosis of the spine, scoliosis with arthritis, all frequently cause pain referred to the abdomen. Other causes of referred abdominal pain are disorders of the ductless glands, thyrotoxicosis, pituitary dysfunction, heart disease, particularly right-sided failure, arteriosclerosis or atheromatosis; renal infections and calculi, hydronephrosis, ureteritis or ureteral stricture; chronic tobacco poisoning and probably other chronic poisonings. Lastly, but by no means least, is that large group of patients with various fears, anxieties, worries, conflicts, maladjustments, repressions, inhibitions and general emotional instability, who have the "spasmogenic aptitude" (Houston), who wander here, there and yonder, receive many diagnoses at the hands of many physicians, such as chronic appendicitis, chronic cholecystitis, retroflexion of the uterus, cystic degeneration of the ovary, cardiospasm, pylorospasm, mucous colitis, visceroptosis, and so on.

Time does not permit of case histories illustrating many of these problems, neither is it possible to discuss the differential diagnostic signs of these various disorders. However, may I again say that the physician who will make the fewest number of errors is the one who will spend plenty of time studying the patient as well as his disease, and one who can combine the science as well as the art of medicine. Errors will still be made because we are human. However, if the above points are kept in mind, their frequency will be lessened.

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DISCUSSION (*Abstract*)

Dr. W. R. Houston, Augusta, Ga.—This discussion has gone forward, as perhaps it should, in the tone of high, serene disinterestedness. We have been nicely balancing diagnostic considerations as though all men were purely objective in their quest for truth. It must be admitted, however, that when these problems are discussed in our rooms, informally over the cigars, it takes a somewhat different turn. We say things that are not said in public assemblies. The speaker very delicately hinted that there might be factors influencing the final judgment as to the causes of abdominal pain other than an exclusively scientific weighing of probabilities. Though these considerations were central in his thoughts, the essayist skirted around them as gingerly as satin slippers around a pool of muddy water. They are considered to lie on too low a plane to be brought before so dignified an assemblage. It would be gross flattery to our profession to presume that all of us at all times approach the question of abdominal pain without bias. The scales are weighted. At the cost of jarring the finer sensibilities I lay aside inhibition and state openly what is in everybody's mind: that a great cause of failure in correctly determining the cause of abdominal pain is money.

In every large community there exists a surgeon, one or more, who looks on abdominal pain not as a diagnostic problem, but as a source of revenue. Often we hear him vilified by name, but he continues a member of the medical society and grows rich. He is more dangerous to the people of his community than a Hyrcanian lion.

The danger to the physician through his having a vested interest in ill health is nowhere more apparent than when he must consider the cause of abdominal pain. We do well to consider this question, gentlemen. It is a proper subject for our deliberations. That critical faculty which we exercise joyously against chiropractors, osteopaths or Christian Scientists—it is painful to turn it against ourselves, but it may prove wholesome. Looking back over the twenty years past I become an optimist as to the intellectual and moral development of our profession. If it is not considered playing the game to say that money is a factor in diagnosis, if somebody objects that a reporter might be present and scoop up this unwary admission, the answer is that we will do best by facing all the facts. The thought of money barbs the shaft of the internist in criticising the surgeon's unwarranted laparotomy; the thought of money sharpens the taunt of the surgeon's comment on the cumbersome diagnostic procedures of the internist in the case where the simplest diagnostic measures would have sufficed.

It is not only money that weights the balance of judgment; we are always driven by the need of action. The need of action is a most deeply seated biological drive. When torn by pain and distress we tear our hair, we rend our garments and—we operate.

Turning aside from the all too human frailty of the diagnostician to consideration of the problem of abdominal pain in objective experience, I beg to call attention to one point which can scarcely be too often stressed. There is a rhythm in the movements of the digestive tube. The rhythm unwinds itself in a kinetic melody. Our mistake is often to seek out and emphasize a single note in the melody, one which is meaningless except as a part of the whole. For instance, a friend was discussing with me a case of dysphagia in which some laryngologist had assured him that the fault lay in the crico-pharyneus muscle. Actually we get nowhere through considering the single elements involved in the complex mechanism of swallowing. In such a case analysis defeats itself. The whole is an orderly rhythm and succession of movements with its cortical projection. We err when we accentuate the localization of symptoms and neglect to consider the entirety of movement. It is as though we attempted to deal with a writer's cramp by studying the separate muscles involved rather than by considering the action in a global way as an expression of situational difficulty. The bias is strong in us toward forcing a diagnosis of organic disease; our greatest and most common errors come from not understanding well enough the emotional facts in etiology.

The disturbances in the motor rhythm of the digestive tubes are often iatrogenic—doctor-made—a result of abusive employment of purgatives and enemata, of a failure to provide for the patient enough sleep, enough rest, enough food.

THE PREOPERATIVE AND POSTOPERATIVE TREATMENT OF ABDOMINAL AND PLASTIC OPERATIONS*

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The routine described in this paper is in use at the Vanderbilt University Hospital in the Department of Obstetrics and Gynecology. No originality is claimed for any of the procedures. They have, however, been carefully tried and have been found most useful.

It has been noted that ward cases, as a rule, run a smoother postoperative course than private or emergency cases. This is attributed to their longer stay in the hospital before operation. The attendant and house staff have more time for study and observation of the patient and for recognition of their idiosyncrasies and the various complications that may exist outside of the chief complaint.

It is most distressing to the patient, as well as to the surgeon, to have a smooth recovery after operation marred by a patient's being unable to void. This complication means routine catheterization with all of its discomforts and the possibility of infection. This can be obviated in many patients by having them learn to empty their bladder and evacuate the bowels in the recumbent posture before operation. We

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have found from experience that this simple lesson will make the first few days after operation much more comfortable.

It is most important that the intestinal tract be thoroughly evacuated before operation. Distended coils of intestine interfere with proper exposure of the operative field and necessitate undue handling of the intestines and the use of excessive packs or sponges. All of this produces postoperative distention and its distressing sequelae. Purgatives are not given before operation. Enemas are given night and morning. On the day of operation an enema is given, and just before the rectal tube is inserted for the administration of the enema, 1 c. c. of pituitrin is given hypodermically. This will make the enema much more effective and will cause the expulsion of large quantities of gas. After the enema is expelled, a rectal tube is left in for 15 minutes in order that any residue of gas or fecal contents may have a free exit, as the pituitrin continues to produce intestinal peristalsis. On opening the abdomen one will be surprised to find the intestines flaccid and ribbon-like. It also prevents in plastic or rectal cases the embarrassment of having fecal matter expelled over the draperies or field of operation.

It is most important that operative patients have a restful night preceding the operation, and for this purpose we give one of the barbituric acid preparations or 30 grains of bromide.

It is our custom to give water by mouth as soon as postoperative nausea ceases and also to give, at the end of all major operations, 2,000 c. c. of saline as a hypodermoclysis. In dehydrated patients, rectal drips of tap water are also used, given at the rate of a pint in three hours and then a three hours' rest before starting proctoclysis again.

Unless there is an indication for early feeding no food is given by mouth for 72 hours. Hot tea or coffee sweetened without milk, or broth, is the first food permitted. A lump of sugar, a half stick of the old-time candy or a lemon drop may also be permitted if such forms of food are indicated. Fruit juices produce flatulency and an acid stomach in a certain number of cases and for this we do not give them routinely, but only in selected cases. The diet is gradually increased as tolerated: milks, soups, and then soft diet, and at the end of a week the regular hospital meals are given.

No attempt is made to move the bowels in the average case until the end of 72 hours. The rectal tube is inserted when gas pains first appear. The first attempt to move the bowels is made by giving low a saturated solution of magnesium sulphate 120 c. c., 30 c. c. of glycerine, and turpentine 8 c. c. It is best administered low through a No. 20 F. male catheter and the patient is told to retain it until a strong urge is felt to expel it. This enema may be repeated in 4 to 6 hours if the occasion demands. We feel that a small amount of fluid given low and through a small tube causes much less annoyance to the patient and is more effective than high enemas given with larger amounts of fluid. After the first good bowel movement a daily evacuation is effected by giving a mild cathartic each night and this is followed in the morning by a low soapsuds enema. We do not give purgatives sufficiently strong or in full doses to produce a bowel action unaided. It has been our experience that it takes a very strong purgative to move the bowels of the average patient in bed and on a limited diet. Strong purgatives cause much distress from their griping effect, which interferes with the patient's rest and makes her generally uncomfortable.

As soon as the patient is conscious, the head of the bed is elevated and she is encouraged to move from side to side. She is also made to take ten deep inspirations every 4 hours. If the operation has been a prolonged one, inhalations of carbon dioxide are given before she leaves the operating room and this is repeated as the occasion demands. In a certain number of cases these precautions will prevent pulmonary complications and atelectasis. These precautions are also carried out following operations under local anesthetics, as collapse of the lungs following their use will occasionally occur. Patients are also daily made to take mild forms of calisthenics consisting of flexion of arms, thighs, legs, forearms, fingers and toes. This produces a feeling of well being, improves the muscular tone and circulation and in our opinion has a tendency to prevent the formation of thrombi and emboli.

Morphine and pantopon are given as needed for the first few days after operation. We do not hesitate at this time to give as much as is needed to keep the patient comfortable. The morphine is often supplemented by the use of the barbituric acid compounds, which are also given after the opium derivatives are stopped.

Where obstruction is suspected, or in cases where distention is causing distress, a duodenal tube is inserted through the nose, attached to a vacuum apparatus and continuously used until the distention is relieved or a definite diagnosis is made. This procedure is the one that is ad-

vocated by Wangeensteen for the treatment of intestinal obstruction and we can most heartily support his claims. It is supplemented by saline as a hypodermoclysis and glucose given intravenously.

After operation the abdominal dressings are held in place by adhesive plaster and a binder. After the nausea, vomiting and distention have passed, these massive dressings are removed and in certain cases no dressings are placed over the abdominal wound, or if one is used, a very light one is held in place by thin strips of adhesive laced across the center. In the cases in which no dressings were applied the union has been by first intention. In our climate no dressings or light ones add much to the patient's comfort, and I believe time and experience will show that in the average abdominal section abdominal dressings can be eliminated at the end of 48 to 72 hours.

Our routine laboratory work before operation consists of Wassermann, urinalysis, phenolsulphonephthalein kidney functional test, white count, red count, and differential, hemoglobin, coagulation time and sedimentation time. A smear for gonococci from the cervix is made in all gynecological cases; also the vaginal secretions are examined for the *Trichomonas vaginalis*. If gonorrhea is suspected, but smears are negative, 1 ounce of 95 per cent alcohol made palatable with sugar and water and a few drops of lemon are given at night and the smear is made the following morning. It is surprising the number of positive smears that one picks up by giving a preliminary dose of alcohol.

The greatest importance is placed on the sedimentation test. Cases are rarely operated upon with a test below 100. We rely on this test in using radium in the treatment of cancer of the cervix. A few deaths can be prevented, and many distressing complications obviated by not using radium with a sedimentation test below 60. In such cases we often give first deep x-ray therapy and in 6 to 8 weeks use radium. Occasionally we clean up the cervix with electrocoagulation or the cautery and then use radium. In a certain number of cancer cases the low sedimentation test is due to a pyometra. Under such circumstances radium is contraindicated until drainage is established by dilatation of the cervix and subsequent rise in the sedimentation time.

All major cases are given a preoperative blood transfusion if the red cells are 2,500,000 or below. We endeavor to give our transfusions before operation and avoid them, if possible, after operation while the patient is under the anesthetic. Severe reactions occasionally occur and if in these cases a transfusion is given while the patient is anesthetized an unnecessary death may occur. Glucose intravenously pre- and postoperatively is used in a large number of cases. The Aschheim-Zondek and Friedman tests are used as a routine in all cases of undiagnosed uterine bleeding.

A preliminary dose of morphine grain 1/6 and atropine grain 1/150 is given one-half hour before the patient is sent to the operating room. Nearly all of our cesarean sections are carried out under a local anesthetic. In these cases we give heroin grain 1/12 instead of the morphine, also scopolamine grain 1/200 is given with the heroin and atropine. We feel that heroin is much safer for the unborn baby than morphine. In these cases the pituitrin is not given preliminary to the morning enema; it is also omitted in other cases in which pituitrin would be contraindicated. The patients who are operated upon under local anesthesia are given 5 grains of sodium luminal the night before the operation and again the morning of the operation. Under this medication the average patient sleeps during the operation and many of them cannot believe that it is over.

We do not starve our patients preceding the operation. The day before operation soft diet is permitted for the morning and mid-day meal and a liquid diet at night. No food is given the morning of the operation except a glass of hot water, if desired. In debilitated patients and in plastic cases an exception is made to the usual routine. We insist upon the patient's drinking large quantities of water the day before the operation.

We prepare the vagina for hysterectomy and cesarean section in the routine way previous to operation. One may start an operation with the idea of only doing a supravaginal hysterectomy, and at operation conditions may be such that a panhysterectomy is necessary. Under such circumstances the vagina may be opened without added risk of sepsis. The vulva and vagina are first scrubbed with green soap and water, then irrigated, and an antiseptic applied externally and internally. We are at present using 5 per cent picric acid dissolved in an alcoholic solution. A study of this is now in progress and we hope in the near future to be able to publish our results on the efficacy of the various antiseptics that are used for vaginal sterilization. Placing the patient in the knee-chest position and opening the vagina with a Sims speculum makes the

application of vaginal antiseptics much easier and more thorough.

All operative cases are catheterized on the operating table before the operation, and in cesarean sections and complete hysterectomies retention catheters are left in place during operation.

An operation that is perfectly carried out is often unsatisfactory to the patient because it is followed by avoidable pains and discomfort. For this reason greater care should be exercised by the profession in the pre- and postoperative treatment.

DISCUSSION (*Abstract*)

Dr. Warren E. Massey, Dallas, Tex.—Two of the cardinal points in postoperative treatment are: first, sufficient rest; and second, to sustain the patient. Morphine is the drug of choice to give the patient complete rest. Few people realize the importance of rest to a patient at this time, and many times we proceed to administer to them so many measures of treatment that they get very little rest. I am very partial to the use of normal saline and glucose intravenously. Different amounts may be required under different conditions, but certainly these two fluids may supply a great deal of liquid which often is not retained by mouth. They can be given quickly without greatly disturbing the patient.

Dr. Guy L. Hunner, Baltimore, Md.—Usually the value of a discussion depends upon the contradictory viewpoints engendered. I am afraid we are in such accord with most of Dr. Burch's views that a discussion will not add much of real value.

For the younger members present who have been trained to accept many of these views as axiomatic it may be of interest to hear something of our former methods, and how some of us were led to discard many of the methods of pre- and postoperative care in vogue thirty years ago. I think we all agree with the implications of the essayist's last statement. We do not discharge our obligations to our patient by the mere act of performing a brilliant operation.

An experience at the end of my first year as a medical student makes me almost ready to recommend that no physician or nurse be granted a diploma until his credentials show that he has had an abdominal section.

In the spring of 1894, almost 40 years ago, the satisfactory results Dr. Halsted was demonstrating with his hernia operation inspired me to devote my first summer vacation to being cured of an inguinal hernia. My idea then of the proper preparation for an operation probably would be accepted now by the average layman as ideal. After examinations were over I went to the tidewater section of the eastern shore of Maryland for a week of boating, fishing, and shore bird shooting. Living conditions in that day and in that section were so affluent that they included a routine of five meals a day with at least five varieties of meat and almost as many sorts of hot bread with each meal. I returned to the hospital Friday noon and got the then routine of an ounce of epsom salts on arrival and another ounce at bedtime. The operation on the following morning was a 100 per cent success, but some of you have heard of the hell of postoperative gas; and the dissecting room studies of the previous year, on the muscles and ligaments of the spinal region, were deeply registered for all time.

Another valuable observation was made soon after I became a surgeon and was admitted to the staff of the Church Home and Infirmary. I was occasionally asked to operate upon the elderly women patients of the Infirmary. Dealing with a large ovarian cyst, a fibroid, a carcinoma of the cervix, a cancer of the bowel, or acute intestinal obstruction, one approached the operation in fear and trembling. Then one was simply amazed at the serene manner in which these elderly women recovered without a postoperative complication, often without the accumulation of gas, and without the need for catheterization. The sedentary life and long weeks or years in bed or near the bed had prepared the excretory organs such as the lungs, intestinal tract, and urinary system, to meet the enforced postoperative rest conditions with less disturbance than obtains with the patient suddenly reduced to these conditions from an active routine of life. By the same token their muscles and ligaments needed no readjustments after operation, and they escaped the pains suffered by the average patient.

During my invaluable nine years of apprenticeship under Dr. Kelly many of our patients came from long distances throughout the South, and many of them developed serious pulmonary complications soon after operation. When one stopped to consider that these patients had spent one or more nights on the sleeping cars under blankets that a day or two previously had covered Northern people going to the sunny Southland to thaw out their pulmonary complications, the complications we saw seemed to have a reasonable explanation. We learned to hold these patients in quarantine a few days before operation; and if inflammatory conditions of the breathing passages developed the operation was further postponed,

The above observations are a few that come to any surgeon over long years of experience and they help to confirm the first statement made today by Dr. Burch, namely: that his clinic has observed that the ward cases, as a rule, run a smoother postoperative course than private or emergency cases.

Some of you may remember that in my Chairman's Address on "Conservative Gynecology" before our Miami meeting I made a plea that we be less hasty in our operative work, and that, unless facing an emergency operation, we hold all of our abdominal patients in the hospital for a week of observation and preparation before operating. Surely our paying patients should have as good a chance as our charity cases. Some object to this seeming unnecessary added burden of hospital expense, but a few words of explanation usually convinces the patient that a week in bed before an abdominal operation makes the postoperative recovery more prompt, far less painful, and less subject to unexpected complications.

In closing, just a word or two about the second point raised by Dr. Burch: postoperative catheterization and cystitis. Formerly we were strongly warned about the dangers of catheterization after operation. Later we learned that the patients who developed postoperative cystitis were usually the ones on whom catheterization had been too long neglected, with the

resulting overdistention and paresis of the bladder musculature. In other words, withholding the catheter does more harm than using it. The patient should be induced to void within six or eight hours after operation. If this fails the catheter should be used. If the catheter has to be used frequently a mild antiseptic solution should be left in the bladder once a day. The patient so unfortunate as to go on to overdistention and paresis is indebted to Arthur Curtis for his insistence that such cases be closely followed with the catheter for days or weeks, if necessary, until we are certain the bladder is capable of functioning without leaving residual urine.

OUR EXPERIENCE WIH DACRYORHINOSTOMY*

By E. C. ELLETT, M.D.,
and
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Chronic infection of the lacrimal sac is a source of never-ending discomfort to the patient because of epiphora, which causes an interference with clear vision and makes use of the eye a hardship; likewise the infected sac gives rise to repeated attacks of inflammation and acts as a source of infection for the operative field if surgery of the eye is necessary. Since probing of the strictured passageway is, as a rule, of temporary benefit only (Fuchs says a permanent result is one of the rarest exceptions) the treatment of this condition has resolved itself into measures designed to end the pathology either by radical or conservative procedures.

Under the former are grouped the methods which aim at destruction of the sac by (a) chemicals, (b) excochleation, (c) by Paquelin or galvanocautery, and (d) excision of the sac. Except in cases requiring intra-ocular surgery in which delay is dangerous, we can see little justification for any of the methods mentioned above. Destruction of the sac does not relieve epiphora. This has been the experience of Torok and Mosher, and it also has been ours.

The conservative treatment of chronic dacryocystitis has aimed at reestablishment of physiological function of the lacrimal apparatus, and good results have been reported from internal and external dacryorhinostomy or a combination of both. These are, respectively, the West operation, the Dupuy-Dutemps and Bourget operation, and the Toti operation modified by Mosher. The first has been uniformly unsatisfactory in our hands, in large measure, perhaps, because of poor technic on our part, but mainly because of the difficulty in the approach. With the latter method we have had no experience at all. With the publication of the Dupuy-Dutemps method (modified by Bourget) by Dr. J. J. Corbett in the *American Journal of Ophthalmology* (vol. 11, page 774, 1928) we were encouraged to resume our attempts at dacryorhinostomy with results which have proven most gratifying to us.

This procedure as described by Corbett is as follows:

"Dupuy-Dutemps injected 2 c. c. of 2 per cent novocain solution in adrenalin chloride along the line of incision. He saturated a cotton plug with a 10 per cent solution of cocain in adrenalin 1 to 1,000, and placed it in the middle meatus of the nose near the anterior tip of the middle turbinate in order to produce anesthesia and ischemia of the nasal mucous membrane. The plug remained in this position until the nasal mucous membrane was exposed by removal of the lacrimal crest. This anesthesia was sufficient to last throughout the operation, and Dupuy-Dutemps stated in his paper of September, 1922, that he had operated on a child thirteen years old with the same anesthesia without any difficulty whatever.

"Illumination of the field of operation is an important factor, and Dupuy-Dutemps uses a concave illuminated head mirror which throws sufficient light into the field. He considers this type of illumination indispensable.

"The skin incision is that commonly used in all external sac operations, starting about 0.5 cm. above the internal palpebral ligament, passing down over its bony insertion (about 5 mm. to the inside of the inner canthus) in a line parallel to the lacrimal crest and terminating at a point opposite the entrance of the nasolacrimal canal.

"The internal palpebral ligament is cut, the superficial fascia, muscle, and deep fascia are divided, and the sac exposed and reflected outward as it is lifted out of its bony groove. The sac is retained in this position by means of a retractor, while a similar retractor holds the structures on the opposite side of the wound well over toward the median line. The retractors are held by one assistant while the other assistant works in the field with the operator.

"The next step is the complete removal of the anterior lacrimal crest by means of a chisel. When the nasal mucous membrane is exposed, the bony opening is enlarged with a Citelli forceps, making an oval-shaped window with the long axis (10 to 12 mm.) in the vertical plane, while the transverse diameter varies from 8 to 10 mm.

"At this stage a longitudinal incision is made in the wall of the sac. The pus or mucus, if present, is removed, and the inner lining of the sac is swabbed with tincture of iodine.

"The nasal plug is then removed. A vertical incision is made in the nasal mucous membrane, equal in

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length and directly opposite the sac incision. Three sutures of 000 catgut are passed through the posterior tip of the nasal mucous membrane with the help of a small semicircular Deschamps needle. These three sutures are held taut whi'e a cut two mm. long is made at a right angle to the upper and to the lower end of the vertical incision. This gives a flap which facilitates approximation to the posterior lip of the sac. The three sutures are now drawn through the posterior lip of the sac incision by means of a small Reverdin needle, tied, and cut close. Thus is formed the posterior wall of the new lacrimal drainage canal.

"After the same fashion three more 000 catgut sutures are passed through the anterior lip of the nasal mucous membrane with the Deschamps needle and held taut while the right angle cuts (similar to those in the posterior lip) are made. These sutures are now drawn through the anterior border of the sac, and, in

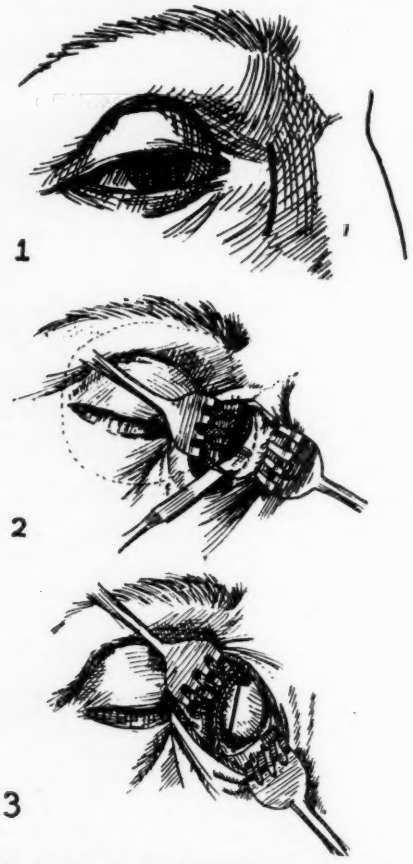

Fig. 1 (Top, 1). Plastic dacryorhinostomy (after Dupuy-Dutemps). Line of skin incision.

Fig. 2 (Center, 2). Plastic dacryorhinostomy (after Dupuy-Dutemps). Lacrimal sac reflected outward. Chisel starts resection of lacrimal crest and finishes along the dotted line.

Fig. 3 (Bottom, 3). Plastic dacryorhinostomy (after Dupuy-Dutemps). The resection of the bony window is completed. Nasal mucous membrane shown as floor in the open wound. Long incision terminating in T formation at each extremity.

Figs. 1, 2 and 3 from *American Journal of Ophthalmology*, 11:774, 1928.

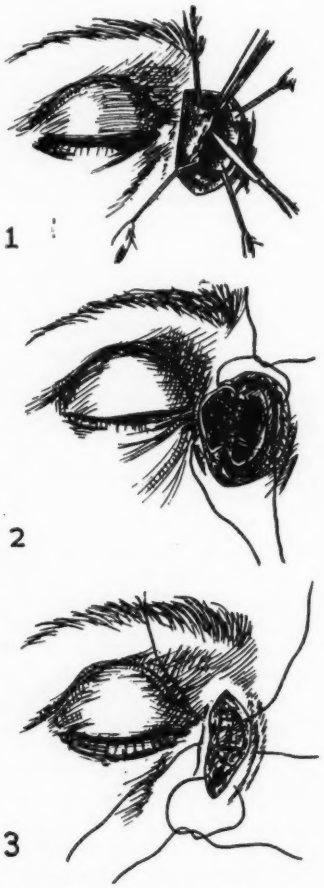

Fig. 4 (Top, 1). Plastic dacryorhinostomy (after Dupuy-Dutemps). This picture shows the opening of the nasal mucous membrane made before that of the sac, according to the old method. Dupuy-Dutemps now prefers to open the sac first and clean it before opening the nasal mucous membrane.

Fig. 5 (Center, 2). Plastic dacryorhinostomy (after Dupuy-Dutemps). The sutures of the posterior edges are tied. Two sutures are passed into the anterior edge and through the periosteum and other subcutaneous tissues.

Fig. 6 (Bottom, 3). Plastic dacryorhinostomy (after Dupuy-Dutemps). The anterior edges of the nasal mucous membrane are brought together by No. 3 catgut sutures. The skin sutures are in place ready to be tied.

Figs. 4, 5 and 6 from *American Journal of Ophthalmology*, 11:774, 1928.

addition, through the periosteum and overlying soft tissues. The sutures are then carefully tied. It is this last little feature of the Dupuy-Dutemps technic (the suspending of the anterior wall of the canal from the overlying tissue) which aids in maintaining the patency of the new lacrimal canal.

"Three silk sutures close the skin incision. An ordinary eye bandage is applied, but there is no intranasal dressing. Sutures are removed on the fifth day, and on the eighth day the bandage is discontinued."

The only change which we have made in this technic has been to give a preliminary hypodermic injection of morphine sulphate gr. ¼ and hyoscin hydrobromide gr. 1/100 and to substitute small half curved number four anchor brand needles for the Deschamps and Reverdin needles. These used with the ordinary needle-holders have proven more practicable in our hands than the specially designed needles.

Good illumination and teamwork help to lower the time of operation considerably and we have been able to cut our operating time from ninety to forty-five minutes by the experience gained in the first few cases.

External dacryorhinostomy appeals to us as a rational procedure for relief of chronic dacryocystitis. The operator can at all times clearly see his field of operation, the procedure is easily done under local anesthesia, the postoperative convalescence is short, and the lacrimal apparatus begins functioning at once.

Since 1929 we have done external dacryorhinostomy twelve times on eleven patients, resulting in twelve complete cures of the existing pathologic condition. Notes on the cases follow in detail.

CASE REPORTS

Case 1.—Mr. A. P. Y., aged 49, was seen June 15, 1923. The right eye had been watering and discharging for 18 months. There was chronic dacryocystitis with a mucocele in the right sac which passed into the nose on pressure over the sac. Daily pressure over the sac was advised. He was seen annually until November 5, 1929, when the sac had become quite large and the discharge had a bad odor. Dacryorhinostomy was done under local anesthesia November 6, 1929. He left the hospital in three days. All symptoms are relieved to date.

Case 2.—W. N. H., aged 47, seen September 12, 1930, had had a mucocele in the left sac for 6 months, with lacrimation and discharge. The mucocele passed into the nose on pressure after probing. He was treated monthly with probing and irrigation. Dacryorhinostomy was done under local anesthesia May 7, 1931. He left the hospital the next day and complete relief of symptoms has been reported to date.

Case 3.—Mrs. J. W. R., aged 76, was seen June 18, 1930. The right eye had been watering for a year. A mucocele in the right sac emptied into the nose on pressure. Monthly treatment with probing and irrigation was instituted. The sac was tender on pressure and at times painful between visits. Finally we could not pass probes because of the pain. Dacryorhinostomy was done June 16, 1931, under local anesthesia. Because of some allergic tests for asthma she remained in the hospital for five days. Complete relief of symptoms is reported to date.

Case 4.—F. P., aged 42, was seen May 28, 1928, because of a watering right eye. The duct admitted water with difficulty and under pressure only. She was treated irregularly by probing and irrigation through three years, during which time a large mucocele developed and acute dacryocystitis finally developed. The sac became the size of a chestnut. October 22, 1931, two months after the attack of acute dacryocystitis, dacryorhinostomy was done under local anesthesia. The patient left the hospital the next day, her symptoms entirely relieved.

Case 5.—Mrs. T. M. K., aged 40, was seen November 5, 1931, complaining of lacrimation for months. A small mucocele in each sac regurgitated into the culde-sac on pressure. No fluid could be passed to the nose. Dacryorhinostomy was done November 9, 1931, on the left eye under local anesthesia. She developed a stitch abscess in the center of the wound, resulting in a slightly disfiguring scar. The same operation was done on the right side November 28, 1931, with a very satisfactory result. She was entirely relieved of her symptoms and is so well satisfied with the result she is not concerned about the scar.

Case 6.—Mr. M. F., aged 40, was seen December 19, 1930, with the right sac swollen and painful for three days and chronic dacryocystitis on the left side for fifteen months. Acute dacryocystitis then developed on the left side and ran a severe course, needing incision repeatedly with irrigation and local treatment.

The right side subsided satisfactorily and dacryorhinostomy under local anesthesia was done April 12, 1931. He left the hospital in two days. Perfect function resulted.

Case 7.—Mrs. P. M., aged 42, was seen June 17, 1932, with a history of left acute dacryocystitis a year previously. Treatment elsewhere by probing brought on acute symptoms again and the patient desired treatment in some other form. There was a broad, dark-blue area in the lower lid resulting from injection with argyrol following the first attack. Neither fluid nor probe could be passed to the nose.

Dacryorhinostomy was done under local anesthesia July 19, 1932. We experienced more trouble with hemorrhage than usual, but completed the operation in the customary way. She left the hospital in three days with entire relief of symptoms. December 4, 1932, the duct was open and the eye dry. A bridle of scar tissue covered the line of incision, which, being of some concern to the patient, was excised under local anesthesia.

Case 8.—A. T., a colored girl, aged 8, was seen August 12, 1932. Her right eye had been watering for three years. We were unable to pass a probe to the nose. Blood Wassermann examinations were negative.

Dacryorhinostomy was done August 17, 1932, under local avertin anesthesia. Ether was required for com-

pletion of the operation. She left the hospital in three days. A perfect result followed.

Case 9.—Miss A. F., aged 15, was seen November 15, 1932, with acute dacryocystitis of the left eye. She had chronic infection of the sac for years with many acute attacks. She was a congenital luetic with a massive perforation of the septum and Hutchinsonian teeth. Much antiluetic treatment had been given by her general physician and her blood Wassermann was negative. Dacryorhinostomy was done December 27, 1932, under local anesthesia with a very satisfactory result.

Case 10.—Mrs. B. Y., aged 41, had acute dacryocystitis in April, 1933, and much watering since. We were unable to probe to the nose or cause the fluid to pass. August 12, 1933, operation was performed under local anesthesia. Some reaction took place in the upper portion of the wound, but there was no suppuration. Fluid passed freely into the nose from the syringe, but the eye was not so dry as previous cases were. There was no overflow of tears on to the cheek, but a drop stood in the inner canthus. Four weeks later the eye became completely dry and has functioned perfectly since. This case, which we regarded at first as a partial success, we now list as a complete cure.

Case 11.—Miss F. L., aged 30, in an auto accident in October, 1932, suffered a fractured and demolished nose which was rebuilt beautifully by Dr. Vilray Blair after several plastic operations. The left nasolacrimal duct was occluded by the accident and the mucocele in the sac with the subsequent epiphora was most annoying. The operation for dacryorhinostomy done October 10, 1933, has resulted in perfect restoration of lacrimal function with relief of all symptoms.

Dupuy-Dutemps classifies the results as "complete failures" in which there was total obliteration of the newly made orifice with persistent epiphora, but no suppuration; "partial successes" are those in which fluid from a syringe could be passed to the nasal passage, but in which epiphora persisted, and "complete cures" are those in which epiphora ceased and there was spontaneous passage of a colored solution from the conjunctival sac into the nose.

In our limited series we achieved twelve complete cures in eleven patients ranging in age from eight to seventy-six years.

It seems to us from this limited experience that one is no longer justified in excising the sac except in a small number of special cases. Dacryorhinostomy offers permanent restoration of physiological function of the lacrimal apparatus with no more operative trauma or longer postoperative convalescence than after excision alone.

DISCUSSION (*Abstract*)

Dr. R. H. Courtney, Richmond, Va.—We all should be grateful to Drs. Ellett and Rychener for reviving our interest in dacryorhinostomy. All surgery should be directed to a return of the physiologic state so far as possible and it is probably true that the name of too many operations end in "-ectomy." I have had no personal familiarity with the procedure here advocated, but of course have been much interested in the work of Dupuy-Dutemps and Corbett. My first interest in the dacryorhinostomy of Dupuy-Dutemps was created by our young colleague, Dr. J. A. White, who had observed the operation in Paris in 1925. Dr. White seemed favorably impressed with the operation, but the technic was not easily comprehensible to one who had not actually observed it. Corbett's report in 1928, with the well executed drawings, made the procedure seem simpler, but yet I have not attempted it because, strangely, in our particular community we do not see a great number of cases of abscess of the tear sac and, furthermore, the great relief obtained by extirpation of the sac, a comparatively simple operation, in removing the troublesome discharge, has made the patients content to accept the epiphora without complaint. In fact, the epiphora has never seemed so distressing in our climate as is described by others.

It is not uncommon to see varying degrees of stenosis of the lacrimal duct, with and without infection, and it has been my experience that most of these can be relieved by irrigation of the passage with the occasional resort to probes. To interpolate briefly, may I call attention to a useful adjuvant in maintaining patency of the duct and removing infection? On several occasions we have made use of lipiodol to visualize the tear passages by x-ray and we found that the infection was lessened and the duct remained patent longer. I now use injections of lipiodol as a therapeutic procedure.

Another matter I should like to mention in connection with surgery of the tear passage is the use of nerve-block rather than infiltration anesthesia. If one injects novocain into the infra-orbital foramen and makes an injection into the orbit just above and just below the pulley of the superior oblique muscle, one can secure anesthesia of the three branches of the nerve supplying this region without distortion of the operative field.

Dr. J. A. White, Richmond, Va.—I am glad to hear Dr. Rychener on this subject, as I was the first one to write about this operation and the first one to do it in this country, although subsequent writers overlooked my contribution which was published in the *International Journal of Surgery* in March, 1926, shortly after my return from Paris that year.

Dr. Emory Hill and I were strolling about Paris, seeing the sights, when we met Dr. Francis, of Buffalo, New York, who suggested that we go to the Rothchild Ophthalmic Foundation to see a remarkable operation for the relief of obstruction of the nasal duct by Dr. Dupuy-Dutemps, who proved to be not only an able ophthalmic surgeon, but an artist as well in the finesse and delicate work which he did in this cure for hopeless epiphora. I was fascinated by it and went every day for six successive days to see it done and on my last day had the pleasure of assisting.

The screen plates which I will show I obtained directly from Dr. Dupuy-Dutemps from a French journal. They differ little from those shown by Dr. Rychener, though the instruments I have here are the duplicates of the ones used in France. I am also showing you the head lamp used, which gives an intense concentrated pencil

of light which thoroughly illuminates the small opening in which most of the work is done. Ninety per cent of cases are permanently cured, 6 per cent partially benefited, and 4 per cent are failures.

The operation is performed as follows:

The skin is washed and painted with iodine and a 2 per cent epinephrinized solution of novocain is deeply injected all around the field of operation. The nose is washed out, cocainized, and a pad of cotton saturated with the novocain solution is pushed well up into the nose over the middle turbinate. A curved incision, with the convexity toward the nose, is made beyond the sac over the lower border of the nasal process of the superior maxillary bone. It starts about 0.5 cm. above the internal palpebral ligament, passes a little beyond its bony insertion, and is carried down to the lower border of the orbit, and slightly farther to the entrance of the nasal duct.

The ligament is loosened from its osseous attachment, as well as its aponeurosis above and below where it covers the sac; the sac being then exposed, is pulled outward and held so by a retractor. Another retractor keeps the wound open, the periosteum is exposed, the upper part of the lacrymal passage is loosened with scissors, not above the dome of the sac, but below to the opening of the nasal duct, to assure good drainage.

The bone is removed by short cuts with a cutting chisel gradually to expose the mucous membrane of the nose without penetrating it, until it is thoroughly open to view. In doing this we may come across some abnormal ethmoid cells, but rarely; and when we do, it is best to destroy them, working up to the crest of the nose.

When the mucous membrane is satisfactorily exposed and the wound clean, it is slit vertically, but you can, if you prefer, slit the sac before the mucous membrane. Then the lower border of the sac opening is united to the lower border of the slit in the mucous membrane with No. 00000 catgut and the upper margin of the sac opening to the upper lip of the slit mucous membrane. The periosteum and the skin opening are then closed.

Dr. M. M. Cullom, Nashville, Tenn.—I am thoroughly convinced that the operation of dacryorhinostomy is the proper procedure in chronic dacryocystitis.

The operation described illustrates a very refined technic.

In 1914, I was visiting Dr. H. P. Mosher in his laboratory at the Harvard Medical School, where he was teaching me the technic of his ethmoid exenteration. In the course of our work on the cadaver he told me that he had taken some interest in the operation of dacryorhinostomy as done by Toti, but had let it lapse.

Any eye with a constant discharge of purulent material into the conjunctival sac from an infected lacrymal sac is potentially in danger of blindness. As small a thing as a foreign body embedded in the cornea may result in an infected ulcer with ultimate loss of the eye.

I have done the Toti-Mosher operation six times with complete relief of symptoms in each case. In three cases I ran into ethmoid cells, which I cleared out from inside the nose. In the other cases nothing was done intra-nasally. I believe in a wide removal of bone at the bed of the lacrymal sac. The bone is thin as a rule in the bed of the sac and a curette can usually be thrust through it, although I found one case where I had to effect entrance with a mallet and gauge. After removing the necessary amount of bone and dividing the mucous membrane I pass a Bowman's probe into the sac and with a Graafe knife and scissors remove about half the sac overlying the opening into the nose. The use of sutures in the sac and the mucous membrane of the nose is a refinement that I have not made use of. So far it has not interfered with the success of the operation, but it would appear that it might be of advantage in preventing closure of the opening into the nose. I will certainly add it to the technic of the operation I perform.

Dr. Ray K. Daily, Houston, Tex.—I wish to confirm what Dr. Rychener has said about the excellent results achieved with the Dupuy-Dutemps operation. After seeing Dupuy-Dutemps operate and taking the Paris course in eye surgery, I have done this operation several times with no special armamentarium and uniformly good results. It is an operation suitable to any ophthalmologist who can use a chisel and rongeur. I have not done more of them because our results are good with the intranasal dacryorhinostomy, which has the advantage of leaving no visible scar. I find patients often disagree with me as to the degree of visibility of a cicatrix, and with the better type of patient it is decidedly advantageous to have no scar. If Dr. Rychener found his results unsatisfactory with the intranasal operation it was probably because of defective surgical technic. The intranasal operation is an operation of skill and belongs to the rhinologist. It justifies the effort of learning its technic; it may be done in cases where the external operation is unsuitable, such as acute cases or acute exacerbations of chronic cases of dacryocystitis, giving almost immediate relief. I have also used it prior to cataract extractions with no complications in the extraction. Within two weeks after the operation, cultures from the conjunctival sac which have been reported repeatedly positive for micro-organisms became negative.

Dr. Rychener (closing).—To excise the lacrimal sac and condemn the patient to a lifetime of epiphora is poor surgery. Studies of the results obtained by excision in other climates than Virginia demonstrate that epiphora persists. Through the courtesy of Dr. Bruce Fralick, Head of the Department of Ophthalmology, University of Michigan Medical School, I am enabled to quote from the statistics of this operation as performed at the University Hospital, Ann Arbor, during the past thirty years. Of those who answered the questionnaire with regard to this operation, 65 per cent still had epiphora and of these practically all answered "No" to the question, "Are you satisfied with the result of the operation?"

I am sorry that we were unfamiliar with Dr. White's early contribution on the Dupuy-Dutemps operation. Review of the literature establishes the priority of his description in our language and the facility of his discussion demonstrates how thoroughly he was engrossed in the subject. I am very glad to have had the opportunity to hear his exposition.

We have no quarrel with other methods of dacryorhinostomy, but advocate that ophthalmologists do something for chronic dacryocystitis other than excision. For us intranasal dacryorhinostomy has been difficult because of the angle of approach, and the necessity for working in the dark has been a handicap. In our hands the Dupuy-Dutemps technic has been satisfactory; the operator can at all times see what he is doing; it is an ophthalmologist's operation in an ophthalmological field.

CHRONIC NASOPHARYNGEAL BURSITIS (THORNWALDT'S DISEASE)*

By DUNBAR ROY, A.B., M.D.,
Atlanta, Georgia

A bursa is defined in Foster's encyclopedic dictionary to be a "pouch, especially a synovial sac." Bursae, as is well known, exist in various portions of the body, especially under the tendons of muscles around the various joints. Their presence can sometimes be traced and their origin determined. There are bursae which are congenital and some which can be traced to arrested development. Among the latter is the bursa pharyngea which occurs in the vault of the pharynx exactly in the median line. Adenoid tissue, varying, of course, both in the amount and the location, can be found in the nasopharyngeal space of nearly every individual. All children, I believe, have adenoid tissue, and this statement is made by one who practices in a Southern climate. The climate does not produce adenoids, but it influences their growth. My experience shows that these growths occur in the black as well as in the white race, notwithstanding the fact that some Southern rhinologists affirm that they never occur among negroes. It is just as natural for adenoids to be present in children as faucial tonsils, and it is a good deal better to remove the obstruction in the nasopharynx of children too often than never to remove them. Harm is never done by the proper use of instruments, but great harm frequently follows their non-use.

As individuals grow older, the adenoid tissue in the vault gradually becomes smaller, depending in a great measure upon the presence or absence of an innate tendency toward a catarrhal condition.

The larger the amount of adenoid tissue present in childhood, the slower its disappearance. It of course never disappears entirely, but is merely transformed. If the patient has been afflicted with a large amount of adenoid tissue in childhood and it was not removed surgically at that period, he will have trouble in the nasopharynx nearly all of his or her life. This tissue, which is gelatinous and polypoid in childhood, will become firmer and more fibrous as the individual becomes older, and instead of being globular or cushion-like, bands of fibrous tissue will be formed, running in the long axis of the pharynx. Between these bands secretion will lodge which will be exceedingly difficult to remove.

Crypts, which normally exist in adenoid tissue, counterparts of the crypts in the faucial tonsils, exist even after all the adenoids have seemingly disappeared, and they always afford a nidus for irritation and for the production of acute follicular nasopharyngitis. I have rarely failed to find remnants of adenoid tissue in patients who complained of nasopharyngeal catarrh.

Rhinologists owe much to Luschka, who was the first to describe minutely the anatomy of the nasopharynx. Anatomists generally agree that there are two kinds of glands in that region: (1) the conglomerate, occurring especially around the mouths of the eustachian tube and the posterior surface of the soft palate; and (2) the follicular glands which are more especially bunched together just at the center of the vault and are commonly known as Luschka's tonsil.

This third tonsil varies considerably in size and formation, being sometimes round or oval and again linear with distinct crevices between the bands.

"At the lower portion of the pharyngeal tonsil, in the median line, a small opening is sometimes present which leads into a sac about three-fourths of an inch long and one-fourth of an inch wide, known as the pharyngeal bursa, the name being given to it by Luschka from a term already used by Meyer in descriptions of pharynges of certain mammalia. The anterior wall of the bursal sac is covered with glandular tissue, while the posterior wall is joined by a ligament to the basilar process of the occipital bone. Some observers deny the existence of this sac as a distinct anatomic structure, holding that this bursa is simply a median fissure of a normal pharyngeal tonsil, the fissure being the result of adhesions to the superficial layers of the glandular tissue" (Burnett's System).

These fissures in Luschka's tonsil vary considerably in different individuals and their presence to any large extent is due, in my opinion, to neglect of adenoids in childhood.

Whether or not the pharyngeal bursa exists is still a mooted question. After the examination of the nasopharyngeal space in several cadavers, I was unable to discover a distinct pouch. This, however, does not disprove its existence. In many cases in which there were decided objective symptoms of nasopharyngeal catarrh I have been able to find this opening in the vault, entirely different in appearance from the slit-like processes frequently found in Luschka's tonsil.

In 1885, Thornwaldt, of Danzig, published an extensive article in which he described still more

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minutely than Luschka had done in 1868 the pharyngeal bursa. The main object of this paper is to show that the large majority of nasopharyngeal catarrhs were due to the presence and diseased condition of this bursa pharyngea. Since that time such a pathologic condition has been spoken of as Thornwaldt's disease.

There is a great diversity of opinion among anatomic investigators as to whether such a bursa exists. In 1878, Ganghofer, after much anatomic investigation, published an extensive article in which he denied the existence of the bursa pharyngea in the form described by Luschka, but described it himself

"as a simple, more or less marked depression of the mucous membranes having no great depth, and not connected with the basilar process, as claimed by Luschka, by means of a strip of cellular tissue."

In 1887, Schwabach, of Berlin, published his investigations on this subject, after studying cadavers to determine the true character of the pharyngeal bursa. He examined 100 adult heads, 28 children's and 2 fetal heads. From his examination he found the condition described previously by Ganghofer,

" a series of deep, irregular and shallow clefts, forming ridges of various heights and breadths, which gradually disappear as age advances."

This depression is well shown in the accompanying plate. In 10 of the 23 preparations examined, Schwabach found more or less defined evidences of the original clefts, and in these the middle cleft was the one partially or completely retained. A few showed a number of openings of varying size. He concludes, therefore, that

"the bursa of Thornwaldt is but the remnant of the middle cleft, the 'purse' or blind pouch being the posterior end, formed by the partial agglutination of the margin. It is but an integral portion of the pharyngeal tonsil, taking part in the diseases to which the latter is subject, but not possessing a pathological character of its own."

Very pertinent to these latter statements are those of Trautmann that various authors, relying solely upon rhinoscopic examinations, have arrived at erroneous conclusions when studying the hyperplasia of adenoid vegetations.

We see that there is as yet much diversity of opinion as to the part played by the bursa in the production of postnasal catarrh. With Schwabach are associated Ganghofer, Trautmann and others, while some close clinical observers, such as Thornwaldt, Massucci and Gradle, have found that their investigations warrant them in attaching much importance to the presence of the bursa pharyngea. In my own mind I am firmly convinced that certain cases of nasopharyngeal catarrh are dependent upon peculiar changes in this region with certain unique objective symptoms, distinctively characteristic.

Within the last thirty-five years I have had 25 cases whose clinical pictures were almost identical in character and which showed a condition of the nasopharynx peculiar to themselves. Three or four of these cases will be briefly described, since the symptoms in all were so nearly identical that a description of one will practically represent all the others.

Mr. L., lawyer, age 27, consulted me on account of an harassing scabby accumulation in his nasopharynx. He gave the following history: he had never been sick in his life, nor was he susceptible to colds. His health was almost perfect except for the postnasal accumulation. He was of a nervous temperament. He had no discharge from the nasal cavities, but behind these there was a constant burning sensation. About once every second day, in trying to clear the postnasal space, he coughed out a scab the size of a ten-cent piece, dry on one side and moist on the other where it had been attached. It always came from the same spot, always had the same formation, and he was conscious of its presence. The patient had an excellent throat to examine, since he had such control over his soft palate that I could use simultaneously both the mirror and the cotton probe. This gave me an excellent opportunity to apply the treatment. I found a postnasal scab situated at the vault of the nasopharynx, just in the center and little below the nasal septum. No secretion could be seen anywhere else. This scab was removed with a piece of cotton on the end of a curved applicator, and from its point of removal was seen a depression into which the end of my little finger would probably fit, at the center of which was found a minute opening.

This opening was entirely different from the slits which proceed from remnants of adenoid tissue, for they showed a region everywhere free from glandular deposit. Nowhere was there any accumulation in Rosemuller's fossa and the nasal cavities appeared perfectly normal. The case differed from ordinary postnasal catarrh, being entirely free from the objective symptoms usually found in that condition. My diagnosis was that of chronic inflammation of the pharyngeal bursa. The prognosis in these cases as to absolute cure is exceedingly unfavorable, and I was fully aware that I had a difficult case to deal with.

The treatment consisted in daily cleansing of the postnasal space with equal parts of peroxide of hydrogen and water. This the patient accomplished himself with a postnasal atomizer. It was easily done because of his great tolerance to instrumental manipulation in this region. I myself used all the well known remedies, such as varying solutions of nitrate of silver, iodine and iodide of potash solution, icthyol, chromic acid, and finally the electrocautery. Curettage was not resorted to, because there was no indication for it. The patient improved somewhat, but his condition was never cured, and he finally passed from under observation.

Case 2.—This case was one quite similar to the first. Mrs. L., age 33, consulted me for annoying symp-

toms like those described above. This lady was quite a vocalist, having a beautiful contralto voice. She complained of an intense burning pain behind the nose and the presence of secretions in the same region which usually came away after thorough douching in the morning. This condition, she said, had existed for two years, but she was able to dislodge the secretions after large amounts of warm salt water had been passed through the nose. The secretion always came away in the form of a distinct scab. Her general health was excellent, which was well exemplified in her physique. On examination the nasal cavities appeared normal, as were also the oropharynx and larynx. This patient also had excellent control of her throat for examination and instrumental manipulation. The only pathologic condition seen was a depression in the median line of the vault just back of the septum, in which was seen some dirty yellowish secretion. This was removed with a cotton applicator, revealing a raw, bleeding surface. An opening, similar to the one seen in the first case, was found at the lower end of this depression, into which the probe could be passed. This patient was treated with various remedies with varying success. She also passed from under observation.

These two cases present an entirely new type of postnasal trouble, different from the ordinary postnasal catarrh in which adenoids are present or there is a distinct nasal lesion.

From the objective symptoms, they offer all the features of the pathologic condition described by Thornwaldt, and every clinical feature of the case points to a diseased state of the pharyngeal bursa. Those who deny the existence of this pathologic condition as a distinct entity, I am sure, base their opinions on an anatomic investigation and not on clinical facts. Such cases, when once seen, are readily recognized because of the great similarity in both their objective and subjective symptoms. The presence of the central depression, the opening at the lower portion from which in one case mucoid matter exuded, the irritated condition of the socket, the presence of a firmly embedded scab, are symptoms distinctly characteristic of this peculiar condition.

Whether the so-called bursa pharyngea is a distinct bursa or blind pouch in the mucous membrane is still undecided, but certain it is that it is the cause of a peculiar form of nasopharyngeal catarrh. My belief is that the bursa or pouch is rarely present normally, but when it is, especially if there be any nasopharyngeal irritation present, and also if there be remnants of old adenoid tissue, it is apt to become catarrhal, and to produce the symptoms which were described in the 2 cases above.

I do not agree entirely with Delavan, who said in a paper read in 1894 that "the so-called Thornwaldt's disease appears to be nothing more than neglected adenoid hypertrophy." A condition other than neglected adenoid hypertrophy must be present, for too many cases of neglected adenoids have been seen with none of the above symptoms. Nor do I agree with Hajek, of Vienna, who believes that Thornwaldt's theory as regards the recessus medius should be set aside, since the identical trouble described by him as limited to that crypt can also be observed in other recesses of the nasopharynx.

This is no theory, but a clinical fact, which can be demonstrated on any typical case. Nor can one find a similar condition in other recesses; but one must realize that this is a pathologic condition, *sui generis*.

We have all seen recesses in cases of old, neglected adenoids, but their appearance even in the presence of much catarrhal trouble is entirely different from the condition under discussion.

In looking up the literature on the subject, it was found that opinion is rather evenly divided among competent observers as to the existence or non-existence of this peculiar pathologic entity. I think this is largely due to the fact that the condition is infrequent and therefore probably many observers do not recognize it. I cannot agree with Thornwaldt in attributing to it every case of postnasal catarrh.

It was the non-success of the treatment in the two cases reported which caused me to study more minutely their clinical features. To treat the postnasal space successfully, one must be able to inspect its surface thoroughly and to make applications just to the points desired. This is not always easy unless the patient has perfect control of his soft palate. One of the peculiar characteristics of the condition is the fact that the nasopharynx in these individuals lends itself to a thorough examination by the postnasal mirror. The method in vogue of mopping the nasopharynx without seeing the point for which the application is intended is both painful to the patient and unscientific. If the patient has not enough control of the muscles of the throat to allow the applicator and postnasal mirror to be used at the same time, then the palate retractor should be brought into requisition and the parts properly treated.

I could never agree with Ziem, of Danzig, who advocates "the routine employment of palpation of the nasopharynx as superior in every way to posterior rhinoscopy." I believe that the reason failure frequently results in the treatment of nasopharyngeal troubles is that this region is not thoroughly examined.

The best treatment which I found in addition

to the thorough cleansing which the patient accomplished at home was an application of a solution of nitrate of silver, 60 grains to the ounce, directly to the sulcus, followed by thorough spraying of the nasopharynx with hot melted vaseline and orthoform. The curette and electrocautery point were tried. Thornwaldt recommends the destruction of the bursa by means of these latter methods. My own success was not at all gratifying. Schmiegelow, of Copenhagen, has reported 3 cases of obstinate postnasal catarrh cured by cauterizing the bursa. Such success, however, has not been obtained by many other observers and a majority report a rather small proportion of cures.

The patient must use a postnasal syringe. Postnasal douches of saline solutions taken daily by the patient will keep him in a fairly comfortable condition, and it is surprising how expert the patients become in dislodging the inspissated lump of mucus. Several of my patients, seen at intervals of ten and twenty years after their first consultation, told me that their condition had greatly improved under daily postnasal douching, and in some cases the discomfort of the original condition was scarcely noticeable.

The prognosis as to ultimate cure in these distinctly characteristic cases is not brilliant, and the laryngologist will be taxed to his utmost to make the patient even comfortable.

DISCUSSION (*Abstract*)

Dr. Emanuel U. Wallerstein, Richmond, Va.—I have never seen a case of Thornwaldt's disease, or if so, I have failed to diagnose it. Upon looking up the subject, I find that no English text-book that I have examined gives more than the most meager details. In fact, discussion is limited to a few paragraphs. However, in the German "Handbook of Diseases of the Ear, Nose and Throat" by Denker and Kahler, which consists of nine large volumes, there is a full account.

Thornwaldt, in 1855, wrote a monograph entitled "The Importance of the Bursa Pharyngea for the Recognition and Treatment of Certain Nasopharyngeal Diseases." In it he not only emphasized the local effects of the condition, but claimed that certain distant effects were produced. These he observed in the ear, nose, larynx and bronchial tree; and he included among the remote symptoms, gastric catarrh, asthma and headache.

He recommended the use of the galvanic cautery, silver nitrate or the surgical removal of the cyst. Other investigators have not been able to confirm Thornwaldt's findings either as to the frequency of occurrence or the importance of the symptoms produced.

Dr. Roy's paper should put us on our guard to recognize this condition.

Dr. W. Wallace Gill, Richmond, Va.—Dr. Roy has given a splendid description of a condition which all of us have seen. Until today, I did not know that it had been dignified by a name. I can recall two typical cases in patients who come to me at intervals now. They never get well. I usually instruct them in the use of a postnasal applicator and have them apply vaseline. The vaseline is liquefied by heating a small quantity in a spoon, the applicator is dipped in the liquid and applied postnasally night and morning. After they become expert in removal of the "button," an application about once a week is sufficient for comfort.

Dr. Roy (closing).—Many years ago I called attention to this unique condition which had not previously been recognized by laryngologists, especially in the South. I am indeed sorry that I cannot offer a treatment which is curative. The relief of the patient will tax the ability of the best men, but fortunately the disease never leads to serious results.

THE TREATMENT OF CHRONIC ALCOHOLISM*

By OSKAR DIETHELM, M.D.,
Baltimore, Maryland

Chronic alcoholism is a widespread illness, and socially and economically an important one. It has, however, received comparatively little attention in recent years, either from the medical profession or from the public. The prevention of alcoholism, on the other hand, and particularly its sociological and educational aspects, has attracted a great deal of interest. We have to realize that chronic alcoholism is a problem with which we, as physicians, have to deal and that we must be prepared to offer constructive help to the alcohol sensitive person. So far as the individual is concerned, the therapeutic goal is complete abstinence. Thus, treatment should begin with immediate withdrawal of alcohol. We should, furthermore, endeavor to change the attitude of the public toward the alcoholic and to promote an understanding of this condition as an illness requiring medical treatment. We also have to help in the prevention of alcoholism by taking a definite stand in the community and making a sincere and whole-hearted effort to influence drinking habits in various social settings.

I shall try to present briefly our understanding of chronic alcoholism and to outline a practical method of treatment, according to the present viewpoint of medicine and particularly

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*From the Henry Phipps Psychiatric Clinic, Johns Hopkins Hospital, Baltimore.

of psychiatry. I shall not discuss the various types of psychotic reactions. Their treatment is fairly well understood by all physicians and I shall limit myself to chronic alcoholism, which is the basis for alcoholic psychoses and therefore needs to be treated after recovery from the psychosis.

It is rather difficult to offer a definition of the term chronic alcoholism which will be acceptable everywhere. In agreement with most psychiatrists, I would say that a man has to be considered a chronic alcoholic when he harms himself or his family through the use of alcohol and cannot be made to realize it, or when he no longer has the will or strength to overcome his habit. The first symptoms of alcoholism are on a toxic basis; later we deal with a definite structural change in the brain.

The treatment of chronic alcoholism has usually been directed along three lines: that of personality analysis, in an endeavor to find strivings which drove the patient into alcoholism; re-education under enforced abstinence; and the use of drugs to change hypothetical chemical processes in the body or to produce a lasting disgust to alcohol through chemical alterations. The attempt to treat with drugs can hardly be called scientific and is therefore usually administered by non-physicians. The large number of persons who seek help in such institutions is an indication of the failure of medical science to outline well-planned treatment.

The only treatment which can be effective in all cases and which can be adjusted to the patient's individual needs is treatment which combines personality analysis and adjustment with habit training over a long period of time and under strict abstinence. Every practitioner knows how difficult it is to achieve satisfactory results, and especially cures, in the treatment of alcoholics outside of hospitals. Nevertheless, we are frequently forced by circumstances to use this method. The main features of treatment are fundamentally the same as I shall outline afterwards in detail, that is: immediate withdrawal of alcohol; a study of all the factors responsible for the development of alcoholism and constructive adjustment of personality difficulties; well organized activities in the patient's daily life, if possible without interruption of work; avoidance of sedatives; and a prolonged education period, with efforts to induce the members of the patient's immediate family to accept abstinence also and to modify their social customs accordingly. If we fail in any of these main points, hospital treatment will be necessary.

In chronic alcoholism we deal with a habit formation which is due to various personality difficulties. The moody person drinks to cheer himself and during periods of slight depression and discouragement. He is in the beginning a spree drinker, but usually develops later into a steady alcoholic. Shy and self-conscious people drink to attain social ease. The lonely, socially maladjusted person tries in this way to forget his longing for understanding which he cannot achieve. We often find drinking as a direct reaction to life situations in order to forget disappointment and failures. Some seek to gain relaxation in states of tension which may be due to situational difficulties or to personality maladjustment. There are others who rely on alcohol to produce the necessary encouragement and push. We also have to consider social drinking habits, which often have a detrimental influence in the case of suggestible persons who are easily influenced by others and lack resistance. To this group belong adolescents, and early alcoholism therefore frequently begins in a college setting.

One can easily understand these reactions when one considers the influence of alcohol on the human personality. It produces a euphoric mood in which the person pushes away inhibitory factors. He feels intellectually stimulated, but lacks perseverance in pursuing a goal. There is a definite decrease in efficiency, indicated physically by increase in pulse rate and metabolic changes, and mentally by less agile mental operations. Due to his euphoric mood, the patient believes in his increased efficiency, while in reality his efficiency is decreased. Due to higher sensory thresholds, his sensation of fatigue is diminished and he therefore erroneously believes in his increased endurance.

There are, of course, marked individual differences in these reactions to alcohol, and we have to realize that there are many variations of susceptibility and tolerance. It is therefore wrong to claim that a definite percentage of alcohol is non-intoxicating. This holds true only for the average person. Persons who have a constitutional tolerance for alcohol are naturally more in danger of developing a serious type of chronic alcoholism than the very susceptible person who, because he easily becomes a social nuisance, is therefore urged by his companions to drink less.

Although certain alcoholic beverages are taken

primarily because of their taste, this factor plays a minor role in alcohol addiction.

Physical factors are etiologically not important except that they may lead to drinking in order to forget pain and to overcome fatigue. While persons with brain lesions are less tolerant, they have no specific craving due to the structural change. Attention has to be paid, however, to physical changes which have been produced by the alcoholic damage and which later may play a contributory role in the need for alcohol. I refer here especially to liver and gastro-intestinal changes.

Based on these facts, we can outline the treatment, which should be divided into two phases. The treatment should begin with a thorough personality investigation, with due attention to the physical status. This reveals the main factors which caused the patient to become addicted to alcohol. We should evaluate his shortcomings and his resources and see how his assets can be used to overcome the difficulties. This allows us to plan carefully the second phase of treatment, which utilizes an individualized re-education.

It is essential that the whole treatment be carried out under complete abstinence from alcohol. Alcoholic drinks should be withdrawn immediately. Immediate withdrawal is psychologically important. It proves to the patient that there is no medical necessity for the use of alcohol in his case, and this realization is the beginning of his re-education. The patient has to break away from many of the ideas, attitudes and habits of his past life and to learn that alcoholic drinks are not necessary for him to be cheerful and happy; that although they may help temporarily, in reality they increase his difficulties. There are no withdrawal symptoms and no danger of the development of a delirium tremens. It is naturally important that the physician use cardiac stimulants for a short time, in cases of marked alcoholism, as a substitute for the stimulating effect of alcohol.

During the first phase of treatment the patient ought to be under close supervision, preferably in a closed psychiatric institution, with definite restriction of his personal freedom. This is essential because the brief state of insight at or shortly after admission lasts only one to two weeks. It is not based on real understanding of the danger of his alcoholism, but on alcoholic euphoric optimism. It is followed by a grouchy revolt of two to four weeks, in which the patient insists upon leaving because he is well or because he does not care for the treatment. After that, real insight develops, which makes the patient willing to cooperate and anxious to see how he can develop self-dependence and self-reliance without the help of alcohol.

After about two months the patient is ready to be transferred to an open institution in which he can lead a healthy life, with a well balanced routine which includes work and suitable recreation and a healthy physical regime. During this second phase of treatment re-education of his habits is given primary attention. Weekly consultation treatment is sufficient for a brief constructive analysis of recurrent personality and behavior difficulties. The patient will gradually learn to deal with slight depressive moods, to cultivate interests which will allow a better adjustment to the group and to develop confidence in himself, which is the basis for social ease and the ability to face failure and disappointment.

A cure has been achieved when the patient no longer needs alcohol and has confidence in himself because he does not have to drink. Treatment should always lead to total abstaining. Moderate drinking during treatment has been advised because many patients develop a spite reaction to the request for complete abstinence. Where this occurs, the physician should endeavor to obtain a better understanding of the factors which caused this behavior and should not give in to requests for moderate drinking.

The atmosphere of the environment is most important. The patient should not feel that he is inferior to those about him because he cannot drink, but that he has no need to drink. A physician who is a total abstainer will achieve better results than a physician who has one attitude for himself and another for his patients.

The preparation of the home environment is also important. The old associations with alcohol have been destroyed in the hospital and the patient should return to a home atmosphere which supports his new attitude. It is therefore essential that his family be willing to abstain also and that no alcoholic beverages be served in his home. The family physician should understand that no alcohol should be prescribed to former alcoholics, and that a brief interview when the patient is disturbed will make sedatives unnecessary.

It is possible to carry out the first phase of treatment in a modern psychiatric hospital in which the physicians have sufficient time to study the patient carefully, but more difficulties

are encountered in finding institutions in which the re-educational phase can be carried out. On the average, the whole hospital stay should last about a year. The patient has to be in a place where he can lead as normal a life as possible and where association with other patients will facilitate adjustment to society. A psychiatric institution cannot fulfill these requirements and special institutions for alcoholic patients are therefore necessary. The hospitals abroad which are devoted to this special phase of treatment are, to my mind, not satisfactory. They carry out a summary type of re-education, do not pay enough attention to the patient's individual needs, and omit planned psychotherapy. I wish, therefore, to outline briefly how such an institution ought to be arranged.

The hospital should be located on a farm with adequate working facilities. All patients would be admitted on a voluntary basis. The farm organization should be based on balanced work and recreation, with group life. Each patient should be required to do a full day's work: outdoor work (farming, gardening, and so on) in good weather, and indoor work, such as carpentry, on rainy days. In such a nearly normal life, in which his individual needs will also be considered, the patient will learn to free himself from his need for alcohol and to deal with his life problems, including adjustment to the group. The stay should average about one year. In the last few months increasing privileges will show the patient's stability and prepare him for the outside adjustment.

It is essential that such a place be self-supporting. This is possible with moderate rates because the patients would do all work for upkeep and improvement and few employees would be necessary. Most important is the selection of a physician (preferably married) who is interested in this work and who has an understanding of group life. The manager might possibly be a woman nurse. It would be important also to have a good carpenter and gardener, who would not be mere employees but interested in the treatment. All the persons employed on the farm should be total abstainers. Much will depend upon the atmosphere which can be created by physician and manager.

Only patients who give a reasonably good prognosis ought to be admitted. The selection of patients has to be made from a personality point of view and the patient's insight and willingness to cooperate. The personality of the patient should be studied during the preliminary stay in the closed hospital and the groundwork for the personality adjustment laid during that time. A farm for the treatment of alcoholics ought, therefore, to be connected with a psychiatric hospital. This would naturally greatly reduce the financial outlay, as it would eliminate hospital and laboratory equipment and offer inexpensive consultation facilities.

In order to achieve a practical solution, such a farm would have to be self-supporting. A preliminary budget for a farm for thirty patients shows that only moderate rates need to be charged. After it has been proven that such a plan is workable, similar farms could be started in connection with state hospitals as the receiving centers. It is no longer justified to put such plans aside by calling them idealistic. They deal in a practical way with a practical issue and point to a solution of a distressing and urgent medical and social ailment. Physicians will have to take the lead and create opportunities for treatment, just as has been done, for example, in the field of tuberculosis.

A survey of all the patients who have been treated at a small Swiss institution (with a maximum capacity of forty patients) during the twenty-five years of its existence shows that about one-half of all the patients admitted have been greatly helped. About one-third of the patients remained total abstainers and about one-fourth made a satisfactory social adjustment, with occasional alcoholic excesses. That hospital is not as well equipped as the farm hospital I have outlined, and even better results could be expected with more modern and aggressive treatment.

DISCUSSION (*Abstract*)

Dr. J. S. DeJarnette, Staunton, Va.—I am sure that Dr. J. K. Hall and I have treated more cases of inebriety and drug addiction than any two men in Virginia. I have treated at the Western State Hospital at Staunton in the last thirteen years over three thousand inebriates and drug addicts.

With this experience I am satisfied that unless a patient sincerely desires to be cured of the liquor or drug habit we can do nothing for him except to debar him from the use of these while he is in the hospital. Anyone who claims there is a specific treatment for alcoholism and drug addiction does so, in my opinion, from lack of experience, ignorance, or an intention to deceive. Nor do I believe that the majority of durnkards or drug addicts are insane, though they may become insane. Magnan has said: "The drunkard becomes insane because he drinks, and the dipsomaniac drinks because he is insane." The line of demarcation is often difficult to discover. The treatment in the Western State Hospital begins after all other procedures have been tried, such as home treatment where

love and pride have exhausted the family finances in paying bills, making good bad checks, standing damages for auto accidents, and so on, and finally at great sacrifice treatment at the private sanatoria is sought. When all else has been exhausted they are sent to the Western State Hospital for treatment.

Our modus operandi is to cut off all liquor and drugs at once, to administer continuous baths, salines, tonics and give a nourishing diet. Work is not compulsory, but is earnestly advised. When they are assigned work a promise is exacted that they will not leave the hospital without permission from the superintendent, and about one-third break their parole in ten days or two weeks, though they know the penalty is close confinement if they are returned to the hospital.

When they are furloughed from our institution they are invariably advised to go home and go to work, to avoid bad company, warned against taking one drink and urged to live in the "dry atmosphere" of which Dr. Diethelm spoke, which is found at home, for the phrase "As dry as a drunkard's wife" is proverbial.

We furlough our inebriates after an agreement with the family that the patient will be returned promptly to the hospital if he takes one drink. We discharge them as recovered only when we have received no bad report of them for two years. I have used the student government plan of control, but after close observation discarded it as of no real value.

For what it is worth I would like to mention here a procedure which has borne some good fruit for me. It is a method of appeal. At regular intervals I make an appeal to these patients not as physician to patient, but as man to man and with some good results. In these heart-to-heart talks I am assisted by outstanding patients and others.

In my opinion the best method of treating inebriates and drug addicts is by education, which should date from babyhood.

"No dream of childhood's early day,
No storm that raged, no thought that ran,
But leaves its impress on the clay
That slowly hardens into man."

UTERINE RELAXATION*

By JAMES R. GARBER, M.D.,
Birmingham, Alabama

The practice of medicine entails exacting and unremitting precision and attention. All medical practitioners are conscious of their responsibilities and realize the importance and necessity of achieving good end-results, not so much for personal glory as for the general good of civilization. Perhaps the burden of such implications, professional, social and economic, are more heavily yoked about the shoulders of obstetricians than any other group of practitioners, inasmuch as this science deals with the protection of the human product from its very inception and ceases only after it has been ushered into society, of which it is an embryo member, but a potential influence in shaping the destinies of men and nations.

Many problems in the duties of the obstetrician arise to plague and harass him. Reading the catalogue of obstetrical complications convinces one that there can be no choice of such unpleasant events, for no case offers the quietude and serenity of a peaceful vista. The silhouette of each one, cast across the fields of maternity, foreshadows maledictions that afflict patient and physician alike, and is the occasion of anxiety and annoyance, especially to the physician.

In presenting the subject of "uterine relaxation" to an audience of proficient and eminent practitioners of obstetrics, the blush of embarrassment and the desire to apologize make it mandatory to ask your indulgence for a discussion which is elementary.

In the performance of obstetrics, do medical attendants emphasize to themselves the urgency and imperativeness of attention to the collateral phases of a maternity case other than the mere anticipation of the act of parturition? Is the average accoucheur ever-mindful of the fact that alertness and preparedness for the unexpected is the yardstick of usefulness and safety? When dealing with the behavior of uterine musculature, meditation upon these pertinent queries will reap its own comforting and peculiar reward.

There is one thing definitely known of the cause of uterine relaxation and another is unknown. Loss of tone of muscle fibre is the direct cause, but why the cause for this effect is enveloped in such uncertainty as to make it the "X" equation in the problem. There can hardly be any dispute of the actual occurrence of uterine atony. That such an entity may be considered genuine and bona fide, permit this quotation from Williams:

"Formerly, I held that atony of the puerperal uterus was a relatively infrequent cause of postpartum hemorrhage, but greater prolonged experience has convinced me that I was in error, and I now regard it as the most usual cause."

Inasmuch as the primary and inherent action of the musculature of the uterus is debatable, let us direct our attention to the more practical predisposing causes, among which we will find

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acts of omission and commission on the part of the attendant contributing to the incidence of the condition: (1) overdistention, due to large babies, twins and hydramnios; (2) prolonged labor; (3) maternal exhaustion; (4) unsuccessful attempts at delivery; (5) acute infectious diseases; (6) myomata; (7) too vigorous and too early attempts to express the placenta; and perhaps (8) the excessive use of a well known oxytocic, bringing about a complete collapse of muscular response to stimulation, are the contributory factors. Fortified with the antecedent problems in the study of the "causus belli," the obstetrical attendant will be remiss in the discharge of an imposed trust should significant warnings be cast aside as inconsequential and impractical.

Another equally important thought in this discussion revolves about prediction of the cases in which relaxation may occur. There can be but one uncompromising and unequivocal answer and that is, in all cases. The obstetrician has no grounds for justifying a contention to the contrary. If there be any one who can predict the results of a storm before its completion, then let him proceed with his gift of clairvoyance into obstetrical work and stalk where angels fear to tread.

It is essential that the time of occurrence of relaxation be mentioned. Naturally, its earliest onset can be only upon delivery of the child, but the tragedy of relaxation may be enacted for a period of two or three hours subsequent to the close of the second stage of labor. This reference is made simply to warn against presumption and a false security of the physician.

The recognition of uterine relaxation may be determined, in the majority of cases, in a direct manner. The consistency of the uterus, its size and location will be the guide-posts of information for the operator. The hemorrhage is usually external, but the occasional observation of internal bleeding may be confusing and misleading. Hence, again, attention to the size and location of the uterus is repeated. When the bleeding remains *in utero* it probably has been occasioned by the vicious use of pituitrin in the first and second stages of labor and ergot preparations during the third stage; by malpositions, dystocias and other elements causing contraction rings and cervical behavior that will imprison the placenta and large blood clots, thereby plugging the canal. The astute clinician will not ponder long in the maze of differential diagnosis. Bleeding from injury to the cervix or perineum results in bright red blood and is observed immediately following delivery of the child with the uterus in a state of contraction, also after the uterus is emptied of the placenta and remains firmly contracted. Bleeding from a partially separated placenta comes in spurts and is increased by uterine contractions. Hemorrhage from a ruptured uterus is associated with a firm, normal size uterus and palpable tumefactions contiguous to the uterine outline.

Considering next the management of uterine relaxation, may not your attention be riveted upon the musical and all-inclusive word, prophylaxis? Through this medium the catastrophe of hemorrhage from this source may be successfully aborted, or, on the other hand, should the emergency arise, thoughtful and meticulous preparedness will be a boon to womankind. The theme thought of prophylaxis is consistent throughout the entire course of treatment, starting during the prenatal period, continuing during the three stages of labor and ending some time in the first few hours of the puerperium. In the prenatal period attention to exercise for elimination and the well being of abdominal musculature; diet for its far-reaching beneficence and rest for its support of bodily resistance are a trimuvirate of incalculable value in preparing for the havoc of a storm in which the currents of life blood may be wasted. At the onset of labor, prophylaxis entails the immediate preparation of the field of operation and mechanical tools used to combat relaxation. When the zero hour strikes and the consciousness of the operator and assistants fade into delirium, or mayhap coma, the time for such preparation has passed, as every energy and thought must be directed toward controlling hemorrhage, even though the means employed to save life today may account for the loss of the same life a few days later as a result of delay and unpreparedness. An important link in the chain of prophylaxis during labor is the prevention of maternal exhaustion. The parturient must be sustained in the course of a prolonged labor by rest, sleep and liquids. This accomplished, she must not be subjected to a veritable inquisition in the second stage of labor. Intelligent and conservative use of pains must supplant the imposition of martyrdom and the role of insanity too frequently practiced by many physicians. As the second stage of labor is terminated, prophylaxis centers about one objective and that is massage of the uterus. This is an irreducible and indispensable measure and

can never be dismissed from routine duties. The medical attendant must personally appraise the condition of the uterus and invoke upon it, at this time, an undivided attention. Should the bleeding be too great and the uterus have a tendency to relax in the third stage of labor, it is mandatory to express the placenta and, failing in this, manual removal is indicated. The writer doubts the wisdom of administering oxytocics in a case that gives reasonable evidence of atony, for in packing the uterus, which procedure is the Big Bertha in the control attack, the action of the drugs may prevent proper work and unquestionably an ill-packed uterus is probably more hazardous than no pack at all. In concluding this phase of the subject permit expression of a personal hobby. The abdominal binder is never permitted for three hours after the completion of labor. The size, consistency and location of the uterus cannot be accurately determined through the binder and its presence and romance of good inveigles the nurse to place confidence in a piece of cloth rather than reliance in mental faculties.

Gentlemen, it is recognized that knowledge is the keystone of the arch in any profession. Some men seek it, others have it thrust upon them, while a certain per cent run away from it. For every one, sentiment must have an appeal: yes, the every-day garden variety of sentimentality strikes the heartstrings of every man when appealed to in behalf of mother, wife, sister, daughter. Obstetrics deals with these loved ones. Possession of scientific knowledge is an undisputed and primary essential for the physician; but an ungoverned professional discipline, an insecure approach to serious duties, may be tempered by the simple thoughts of sympathy and affection.

DISCUSSION (*Abstract*)

Dr. W. T. Pride, Memphis, Tenn.—I have for several years stressed the importance of diet and particularly calcium in every case of pregnancy, and for the past three years we have not had a postpartum hemorrhage. We are now carrying on a series of experiments in the Obstetrical Department of the University of Tennessee for the study of slight hemorrhages occurring during pregnancy, which are no doubt due in many cases to uterine relaxation. We are giving calcium and parathormone. In spite of all modern methods of treatment and prevention, this condition is still seen.

Dr. Thomas Benton Sellers, New Orleans, La.—The significance of the milder forms of uterine relaxation is frequently overlooked by the average accoucheur. In such cases, the loss of blood, though not sufficient to endanger the patient's life at the time, may definitely lower her resistance to infection, increasing the likelihood of postpartum infection and often prolonging the period of convalescence.

Oxytocic agents should not be used except for the induction of labor and in selected cases of multiparae in which small doses may be given cautiously. The free use of morphine affords the necessary rest in prolonged labors, thus preventing exhaustion, one of the most common causes of uterine relaxation. When the patient cannot retain nourishment, intravenous glucose should be given to avoid marked dehydration and acidosis.

A minimum of fifteen to twenty minutes should be allowed for spontaneous separation of the placenta, unless excessive bleeding necessitates immediate removal. It is also important not to attempt perineal repair during this period, as the management of the third stage of labor is of sufficient importance to claim the undivided attention of the accoucheur.

Dr. Wm. T. McConnell, Louisville, Ky.—This subject is one of the most vital importance in obstetrics, as it is fraught with danger to the mother. Postpartum bleeding from the uterus occurs because of failure of the uterus to contract normally. There are a number of causes for this misfortune, chief among which are over-distention of the uterus due to twins, hydramnios, and so forth, prolonged anesthesia, long fatiguing labors, and, last but not least, too great haste in expressing the placenta. At the beginning of the third stage, there is a physiological relaxation of the uterus and unless there is undue bleeding from the placental site because of partial separation of the placenta, no effort at expression should be made until the uterus has regained its tone and regular strong contractions have become reestablished. During labor the end products of exertion collect in the musculature of the body and as soon as the baby is born there is a general let-down of the whole muscular system until the oxidizing process of the blood stream can rid the body of these products of fatigue. If the placenta is expelled before the body has had time to make this readjustment, undue uterine relaxation is very likely to occur. Therefore, the keynote of the conduct of the third stage of labor is to have adequate uterine contractions before any interference is attempted. Usually a 10 per cent solution of carbon dioxide and 90 per cent oxygen mixture administered in cases where utrine relaxation is likely to occur is a very effective prophylactic, as it quickly oxidizes lactic acid and the other fatigue products that have accumulated. Fatigue is the cause of much obstetrical shock, especially in prolonged labors or prolonged anesthesia, and should enlist from us the most careful watching of our patients.

Dr. M. Pierce Rucker, Richmond, Va.—There is one condition, fortunately a rare one, that may cause postpartum hemorrhage, and that is shock. I do not refer to the shock that follows hemorrhage, but the so-called obstetrical shock that may come on two or three hours after delivery in the absence of any abnormal loss of blood. The patient gets ashen in color and her blood pressure drops alarmingly. There is a general relaxation of the viscera, sometimes with nausea and some-

times with bleeding from the uterus. Occasionally the condition follows sodium amytal anesthesia, but I have seen it follow chloroform anesthesia and have seen it also when the patient has had no anesthesia. The few patients whom I have seen with this condition have usually responded to elevation of the foot of the bed and a hypodermic injection of strychnine grains 1/30 and possibly a hypodermoclysis, but fatal cases have been reported. Such a case causes the obstetrician considerable alarm.

PYELITIS IN PREGNANCY*

By JOSEPH F. GEISINGER, M.D.,
Richmond, Virginia

Pyelitis in pregnancy appears to the urological clinic in exaggerated grades, which, by rebellious clinical behavior, have been sifted from a much larger group amenable, as a rule, to simple medical oversight.

It is necessary to keep this differentiation sharply in mind; otherwise the urologist's discussion of this ever interesting subject may be mistaken, as it often has been, for the overenthusiasm of a specialist for his tools. As a matter of fact, thoughtful urologists have steadfastly maintained an attitude of distinct conservatism toward renal infection in general, and pyelitis in pregnancy in particular. They recognize without question that a large majority of these cases, properly managed, will yield to ordinary supervision and medication. They approach consideration of more particular measures not because their daily habits lead them to hold cystoscopy lightly, but because the patients reaching them are almost invariably of this isolated class, which have stubbornly resisted all previous treatment and which are now obviously, sometimes dramatically, in need of more heroic attention. This need, they are convinced, can be met only by means of resort to the instrumentation which thereupon, but not until then, becomes prominent in their discussion. Certain fundamental urological principles underlie this so-called radical attitude, and it is the especial object of this paper to describe these, and to review the results attendant upon their practical application in a series of the writer's cases.

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Except insofar as may be necessary to explain the therapeutic approach, it will not be appropriate to a clinic of this sort to enter into any elaboration of the various mooted etiological and other problems associated with the renal infections occurring in the course of pregnancy and the puerperium. These problems, it is true, hold much of interest to the student, and the diligent research of recent years has brought to light other factors than the simple mechanical back pressure effects of the enlarging uterus, which, though still of great consequence, do not, as was once assumed, express the entire story. Such are the physiological widening, lengthening and consequent looping of the ureter pointed out by various observers and more recently attributed, at least in part, to possible endocrine or general metabolic processes peculiar to pregnancy and temporarily affecting the smooth musculature of the entire system along with that of the uterus; the kinking or narrowing of the ureter at the pelvic brim as a result of the downward displacement of the bladder noted by Waldeyer; angulation of the juxtavesical portion of the right ureter and coincident stretching of the left ureter as a result of the common dextro-rotation of the uterus, discussed by Hofbauer; the edema of the mucosa of the ureter and trigone said by Mirabeau always to accompany the pregnant state; the partial strangulation of the ureter by the uterine artery, which is enormously increased in size during pregnancy, as emphasized by van Deuzen; the actual change in the architecture of the lower ureteral segment described in the reports of Hofbauer and Carson, who have demonstrated hyperplastic and hypertrophic changes in both the musculature and the connective tissue.

When, however, the utmost has been said in reference to these interesting sidelights upon the processes contributing to the clinical picture of pyelitis in pregnancy, it must be admitted that they are of more theoretical than practical importance, since they are all concerned with the physiological event of pregnancy and will probably never be subject to any efficient modification by human intervention. The sum total of their effect, however, expressed in the single word, stasis, is of enormous clinical consequence; and since the causes can in all likelihood never be removed, the effect will be equally persistent with all of its secondary implications. But, unlike the causes, this effect is amenable to interference and this fact constitutes the key to the treatment presently to be considered.

It is now fairly generally recognized that as a consequence of pregnancy, either from direct pressure of the uterus or from some of the coincident alterations in ureteral structure, course,

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or contour indicated above, dilatation of some degree, with accompanying retention of urine, exists in the upper urinary tract of practically every pregnant woman. It begins even in the earliest months, continues throughout the pregnancy, and usually subsides after delivery, leaving the kidney essentially unharmed unless infection or stricture complicates the picture or pregnancies succeed one another too rapidly to permit recession in the intervening intervals. The dilatation is by no means universally and yet is quite commonly bilateral, though, for reasons not fully understood and probably not sufficiently explained by simple dextro-rotation of the uterus, it is generally much more marked upon the right side than upon the left. The ancient and much-quoted necropsy statistics of Jolly indicating limitation of dilatation to one side in the majority of cases, have not withstood the more recent pyelographic evidence of bilateral dilatation furnished by others, including ourselves. The same observation is true of the assertion of Cumston that the dilatation exists only above the brim of the bony pelvis; it is quite easy in a certain number of cases to demonstrate involvement of the entire upper tract, beginning at or quite near the vesical wall, a statement which we make upon the strength of our own data and with full realization of recent reports indicating a contrary opinion.

Though recognition of such stagnation of urine as an outstanding factor in relation to urinary tract infection is of fundamental importance to the urologist, it must be understood that the physiological stasis here described does not constitute pyelitis in pregnancy, though it may have some relationship to the "kidney of pregnancy" discussed by Hayes. In fact, and a rather extraordinary one it is, 90 per cent or more of pregnant women escape, in spite of this stasis. In the remainder, accessory etiological factors enter and clinical pyelitis results. The nature of these accessory factors is not always obvious. In some instances they can be determined and since they are not indissolubly linked with the physiological process of pregnancy itself, they are amenable to alteration and become, therefore, of great practical importance. Undoubtedly, for instance, the pyelitis appearing in pregnancy is sometimes a relighting of an infection that began in infancy or childhood and lay dormant until incited to fresh activity by the overloading of the urinary tract. More diligent and thorough treatment of these childhood infections would probably reduce the incidence of pyelitis in pregnancy. In other cases, antecedent strictures in the ureter may play a significant role, inviting prophylaxis on the one side and requiring, on the other, postpartum treatment to prevent recurrences. In all cases, foci of infection, if existent, will receive very respectful attention, especially in the teeth, tonsils, sinuses, urethra, cervix, and intestinal tract. Finally, the demonstration of Sano that during the second half of pregnancy there occurs a marked lowering of resistance of the organism to infection, is entitled to consideration and suggests the institution of any reasonable measures to restore the resistance to the utmost extent.

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When, as a result of the addition of one or more of these inconstant accessory factors to the constant factor of stasis, infection supervenes, the patient joins the unhappy minority afflicted with so-called pyelitis in pregnancy. The organism is usually the colon bacillus, though others may be found, especially staphylococci. The route of invasion is the blood stream or the lymphatic system, which distributes bacteria from remote foci; or the ureter which may transmit a reflux of infected residual urine from the bladder to the kidney. This latter path is probably more frequent than is commonly supposed. The infection may become manifest at any time during pregnancy, but is most likely to appear from the fourth or fifth month onward, when the uterus is rising beyond the brim of the bony pelvis and beginning to exert marked pressure or torsion effects.

The clinical picture has been drawn in the preceding report from the obstetrical service. It varies from a barely perceptible deviation from the normal to a violent outburst attended by severe pain, high fever, and a toxic or septic state of threatening aspect. In its lesser grades its effects are often transient and trivial. In its exaggerated grades, it constitutes one of the major complications of pregnancy, being responsible for high fetal mortality and, according to De Lee, being present in some degree in two-thirds of all the women who die during pregnancy. And since the lesser grades may be suddenly and rapidly transformed into the severer types, it is essential always to be alert for the manifestations of urinary tract infection during pregnancy, however slight they may be and however they may tend to lurk in the guise of simple malaise, mild malaria, chronic appendicitis, or some other masquerade. This is the affair not of the urologist, but of the obstetrician. He can do much, and actually does much

by periodic urinalysis throughout pregnancy, by investigation and treatment with reference to residual vesical urine, by attentive consideration to what may at first glance appear to be quite minor complaints. Timely insistence upon rest in bed at this stage, with the ingestion of large quantities of water and the use of an alkali by mouth will abort many cases. Many others, farther advanced and already with fever, will yield to the same simple measures, but have to be more closely watched, with instrumental intervention always at hand in the event that symptoms do not subside in a reasonable time. Postural treatment may, and probably should, be tried, though it has never given us any appreciable results. A small pillow in the lumbar region, either by tilting the overfilled pelvis or, as Keyes suggests, by straightening the kinked ureter, is of very real assistance in promoting drainage, as the urologist may readily demonstrate to himself by meatoscopy. Urinary antiseptics will also have some place in the treatment. Their actual value in urinary tract infections not associated with obstruction and retention is very questionable in our judgment. With pyelitis in pregnancy this retention is present and the antiseptics would appear to have one of their greatest opportunities for efficiency in this field, provided they are not diluted by too large a fluid intake. We have found no antiseptic superior to methenamine.

* * * *

By this consistent oversight and simple but efficient treatment, the obstetrician, without the aid of the urologist, will control the majority of cases of pyelitis passing through his hands. In a certain number of instances his efforts will fail and the condition of the patient will remain stationary or grow steadily worse. It is then essential that some additional measures be instituted, and it is here that the urologist enters the picture. To him the indication is now clear-cut and definite, representing, as noted at the outset, a fundamental urological principle, namely, the establishment of drainage wherever there exists a coincidence of stasis and infection, whether it be in a pregnant female or a prostatic male. The fact that a few obstetricians of unquestioned ability continue to resist the application of this principle, well established by urological experience throughout the world, is puzzling. The great body of obstetricians have fortunately long ago swung squarely into line with the urologists upon this pivotal point in the management of these severe, sometimes fatal, cases.

That this drainage is best accomplished with the ureteral catheter is universally recognized. Actual surgical intervention in the form of nephrotomy or pyelotomy is rarely indicated, perhaps never. Evacuation of the uterus will be required in a few very serious and rebellious cases, but only after catheter drainage has been thoroughly tried.

The method of employing the catheter will vary with the habits and attitudes of the individual urologist. In the hands of some, the catheter will be used to evacuate and perhaps irrigate the pelvis and will then be removed, the procedure being repeated as frequently and over as long a period of time as the behavior of the case may dictate. Others will prefer to leave the catheter in the ureter for continuous drainage for hours, days, or even weeks. Much discussion has arisen in connection with this latter procedure and some sharp differences of opinion have developed. The trauma to the ureter consequent upon the presence within its lumen of a foreign body has been emphasized by some to the point of outspoken condemnation of the practice and the same attitude has been applied for the same reason to the oversized catheters heartily recommended by Pugh and others. That such trauma actually occurs must in the nature of things be admitted and that it is appropriate to avoid it if possible goes without the saying. But it is our deliberate judgment, in the light of our own experiences, that both the degree and the danger of this trauma have been exaggerated and that this consideration is not sufficient to justify denial to the patient of the great benefit of continuous drainage if her condition seems to make this desirable.

It is our own habit, therefore, to fit the treatment to the patient rather than to follow a preconceived program regardless of the clinical variations and needs in the types encountered. We proceed upon the basic principle of accomplishing the desired results with the least possible insult to the tissues involved. Therefore, if the situation can be controlled by simple catheterization, this course is followed and is recognized as the ideal. But if conditions appear to require a retained catheter, it is employed without hesitancy and we have yet to encounter any incidents causing us to regret it. The visible benefits of full drainage far outweigh the presumptive harmful influence of ureteral trauma. The length of time that the catheter is kept in place is determined by the patient. Upon the same principle of avoidance of unnecessary insult, it is removed as soon as possible, perhaps in a day or two, or three; but the dictates of clinical cir-

cumstances may cause us to lengthen this interval and we may as well admit, though with some trepidation, that we have occasionally extended the period to ten days, and in at least one instance to three weeks. In extenuation we hurry to explain that all these patients recovered in spite of the treatment, whereas most of them were seriously, even desperately, ill before it was instituted.

So far as the catheters themselves are concerned, it is important to use the stouter x-ray stock which will not begin to crumble within the ureter after prolonged exposure to urine. We have employed sizes varying from small (No. 5) to large (No. 14). We prefer the moderate sizes (Nos. 6 to 8), less out of consideration for the ureter, however, than for the fact that for some mysterious reason they seem, in our hands, to drain more consistently than the others. Occasionally we have found paired catheters helpful in permitting continuous irrigation in badly infected pelves. As a rule, however, with the catheter *in situ*, pelvic irrigation has a minor place in our therapy, the catheter being simply flushed now and then with sterile water or some bland solution to maintain its patency. At one time we considered antiseptic douching of the pelvis an important adjunct, but we are now convinced that in acute cases it is vastly better to depend upon simple drainage and not torture the laboring tissues with irritating drugs. Later on, after the acute stage has subsided and the infection is persistent but indolent, local antiseptics are of genuine worth and among them none can equal silver nitrate, provided some pains be taken before removal of the catheter to drain or wash out the heavy precipitate of silver chloride which otherwise will linger for some time in a pelvis not capable of emptying itself completely.

Under this management, the keynote of which is obviously drainage by one means or another, pyelitis in pregnancy will be controllable in most instances, but not in all. Along with this drainage one, of course, employs all other measures that may contribute to the ultimate result. Chief among these is a large fluid intake, preferably by mouth, but under the skin or by vein if necessary. While drainage is in progress we rarely are concerned with internal urinary antiseptics. Attention to the bowels and the general comfort of the patient is taken for granted. The small pillow under the loin previously mentioned is quite important. Any other postural maneuver in the acutely ill patient is brutal and will probably be entirely inefficient in any event.

In a very small percentage of patients, usually gravely ill, the clinical picture seems dependent not alone upon retention and infection within the urinary channels, pelvis and ureter, but upon extensive involvement of the renal parenchyma itself. Here the usual dramatic results of catheter drainage will not be evident and the patient will remain obviously in need of some additional assistance. In our efforts to accomplish this, we have been led, after trials in various directions, to rely occasionally upon blood transfusion, but usually upon the use of mercurochrome intravenously. With a few exceptions, references to this drug in the literature are either timid and hesitant or else downright condemnatory, chiefly on account of its supposed deleterious effect upon the fetus and its supposed lack of benefit to the mother. We have observed no such effects, but have demonstrated the benefits in several instances. We are fully conscious that this suggestion will not prove popular, but though ever respectful of the opinions of other competent observers, we feel compelled to be guided by our own experience, which up to this writing is emphatically favorable. The drug is used in 1 per cent solution and in a quantity about equivalent to 2.5 mg. per kilogram of body weight. The cases are carefully picked. In the patient, fortunately rare, collapse of whose renal function accompanies the other evidences of a very grave condition, mercurochrome should never be tried because of its possible irritant effect upon kidneys already upon the verge of extinction. I am aware of no other absolute contraindication for its use.

* * * *

My own personal contact with pyelitis in pregnancy is concerned with an indefinite and fairly large group of mild cases requiring no instrumentation and with 69 others in whom full cystoscopy was considered necessary. In the latter group one patient died in spite of drainage, blood transfusions, evacuation of the uterus, and various other measures. This woman was brought into the hospital desperately ill, showed no response to treatment, became deeply jaundiced, and gave other evidences of the probable presence of acute yellow atrophy of the liver, along with her pyelitis. About 90 per cent of the others in the group weathered the infection and went to a delivery safe for both mother and child.

We cannot, therefore, match the experience of some who say that interruption of pregnancy is never necessary. In two or three cases, seri-

ously infected, spontaneous abortion occurred and no effort was made to prevent it, this being regarded as the easiest and safest way out of the difficulty. Now and then abortion has been induced before the period of viability and in our judgment it should not be delayed when consistent conservative effort still leaves the mother's life hanging in the balance. More frequently we have recommended the induction of labor after viability is assured, but before full term has been reached. This, it seems to us, is in certain instances a merciful and sensible procedure, not sacrificing the child and yet relieving the mother of many discomforts and the kidneys of a load they should not be forced to carry longer than necessary.

Our conception of the alterations occurring within the urinary tract during pregnancy is based upon a careful study of the reports of others, but especially upon our own investigations. Out of a considerable mass of pyelographic data we have submitted a few characteristic specimens; the remainder are more or less uniform repetitions of these. It must be explained that we do not recommend routine pyelography in the pyelitis of pregnancy. In fact, unless atypical behavior of a case suggests the possibility of an anomaly or some other unusual complication, pyelography is best avoided. In any event it should be reserved for a quiescent afebrile period; otherwise, by possible pyelovenous backflow, it may distribute the infection and produce disastrous effects. Our own data have been assembled with these precautions fully in mind, and since acquiring an amount sufficient to guide us in this work, we have usually deferred pyelography, if we undertake it at all, until termination of the pregnancy.

The plates fairly consistently correlate the findings of Kretschmer, Seng, and many others, exhibiting moderate to extensive dilatation in almost all cases, with widening, lengthening and looping of the ureter. The dilatation will be seen to be often bilateral, but most marked upon the right side. In most instances it seems to stop sharply at the pelvic brim, as indicated by Cumston; a close inspection of these plates shows the fetus tightly applied to the right side of the bony pelvis and less so upon the opposite side, which is most suggestive in spite of the question raised with reference to the actual influence of dextro-rotation. In some instances, contrary to the assertions of Cumston, the dilatation extends throughout the ureter and reaches the region of the bladder.

Pyelographic reviews in the postpartum period show recession of this dilatation. The ureters may return to normal, but do not always do so. The time required for this recession is variable, and during this interval, as noted by Crabtree, the patient should remain under observation, with such treatment as may be indicated by the degree of her residual infection. Especially should she not enter upon another pregnancy until the urinary tract has recovered from the one preceding it. Failure to heed this injunction will be likely to result in permanent lack of tonicity with its disagreeable sequelae. In fact, we are fully convinced that many of the dilatations of the ureter and pelvis disclosed unexpectedly in non-pregnant women in the course of routine cystoscopy had their origin in a previous pregnancy. We have assembled some data bearing upon this point, but that is another story which has no place in the present discussion.

Stuart Circle Hospital

VINCENT'S ANGINA*

COMPLICATIONS AND TREATMENT

By M. T. VAN STUDDIFORD, M.D.,
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Briefly, the history of Vincent's angina dates from Leeuwenhoek, the Dutch scientist, in a communication to the Royal Society of England, dated 1722, when he reported that with his crude microscope he saw "beasties," the organisms which we regard as belonging to the general group of spirochetes. Miller, in 1883, described certain organisms which he considered the cause of ulcerative conditions about the teeth. He described a fusiform bacillus and a shorter organism which he called the comma bacillus. In addition he described a spirochete. Plaut, of Germany, in 1896, writing on the differential diagnosis of throat affections, referred to these organisms as Miller's organisms. Vincent, of France, in 1898, described the same organisms as the cause of an ulceromembranous type of tonsillitis and gingivitis. In Europe, the disease is designated as Plaut-Vincent's angina. In this country numerous synonyms are used, such as ulceromembranous angina, pseudomembranous or chancriform tonsillitis and gingivitis, trench mouth and so on. In 1923, the American Dental Association Council on No-

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menclature adopted the term Vincent's infection to designate the gingival pathology of the disease. The organisms described by Miller, Plaut and Vincent are two in number, the one being a gram-positive spirochete and the other a nonmotile gram-negative fusiform bacillus. Recently the Society of American Bacteriologists adopted the terms *Borrelia vincenti* instead of *Spirochete vincenti* and *Fusiform dentium* instead of *Bacillus fusiformis*.

Vincent's infection to the otolaryngologist pictures an ulceromembranous lesion involving lymphoid tissue of structures in Waldeyer's ring: that is, the ring of lymphoid tissue formed by lingual, pharyngeal and faucial tonsils. To the dental surgeon it means an ulceromembranous gingivitis; to the dermatologist it is of interest because of its similarity to other diseases causing a stomatitis. Its usual symptoms are: in children a maceration of the epithelium of the labial border is often found. The lesion in the mouth is apt to appear along the gum terminating in a sharp line at the gingival margin. This lesion is covered by what seems to be a white membrane that is really necrotic tissue and extends downward into the gums for a variable distance. The gums are often retracted from the teeth; the surfaces are tender and any attempt to remove the slough sets up considerable pain and protracted bleeding. Large numbers of typical organisms are situated in these tissues. There may be an associated rise of temperature to 100 to 102°, together with a swollen, reddened, furred tongue which shows tooth print depressions on its edges. There may be gastric disturbances and general malaise, and a fetid, somewhat characteristic odor is usually present. The gums are very spongy and swollen. The buccal membrane in apposition with the teeth and gums may show a typical necrotic stomatitis varying in degree from slight to severe ulceration.

Adults usually have less widespread gingivitis than children. It commences as a small ulceration of the interdental gum and shows a tendency to heal in one place and break out in another. Lesions on the tonsils may cause marked enlargement, with small necrotic islands, or one larger necrotic crater covered over by a dirty white or grey slough resembling that produced by an application of phenol.

ETIOLOGY AND PATHOLOGY

The etiology of Vincent's disease has been the subject of extensive investigation and of fervid controversy. The relationship of the fusiform bacillus or the spirochete to the lesion or to each other is placed in doubt by some researches, but appears to be held very important by most authorities. Consideration of the points at issue are beyond the scope of this presentation. Whatever the etiology, the condition remains a clinical entity of great importance and must be so handled by the clinician.

The pathology of the disease is also a matter of controversy. As much of the literature is vague, I quote Dr. F. M. Johns, our clinical pathologist. It is his opinion that the *Fusiformi dentium* is a corynebacterium (liberating exotoxins), which produces a non-pyogenic necrosis and this in turn renders the tissues suitable for the invasion by the *Borrelia vincenti,* the latter living as a saprophyte. He is also of the opinion that one cannot tell whether a stained smear is from a quiescent or active case.

Laboratory Diagnosis and Staining.—The material to be examined by the clinical pathologist should be obtained by scraping necrotic tissue from the deepest portions of the lesion in areas where it is seen that blood will flow freely. The material is spread smoothly on a slide and fixed with heat. It should then be stained with the carbol-fuchsin contrast stain. This is carried out as follows: carbol-fuchsin should be placed on the warm slide and allowed to remain two to three minutes. It is then washed and lightly decolorized with alcohol. Loeffler's methylene blue is applied for 2 minutes. The slide is then washed and dried.

DIFFERENTIAL DIAGNOSIS

Among the diseases to be excluded in making a diagnosis is diphtheria, in part by the appearance of the gums. These are dirty white or show a pasty grey slough as if produced by painting with phenol; there is a cupped out area on the tonsil, a tendency to bleed when the smear is made, with the presence of typical organisms on stained films. Diphtheria can best be diagnosed successfully by cultures on Loeffler's serum medium. Often diphtheria and Vincent's infection are both present, the former acting as a devitalizing and debilitating agent to produce the disease. Where diphtheria has been found and improvement with antitoxin is not satisfactory, Vincent's should be suspected and so treated, and vice versa.

Noma is usually a unilateral disease. It may start on the gingival margin and spread to the buccal membrane in one area or in many. The cheek rapidly swells, becomes stony hard with

edema and soon the eyelid may become swollen to such an extent that the eye is closed. Perforation frequently occurs in one ulcer and spreads to the corner of the mouth, with subsequent involvement of the bony tissues of the mandible or maxilla. Vincent organisms are found, but the rapid destruction of the affected tissues decides the diagnosis.

Sprue patches on the tongue and mouth are red and partially denuded of epithelium in varying degree. Small vesicles form, break and leave a raw, ulcerated yellowish slough around the margins of the tongue, frenulum and under surface. The sore mouth, emaciation and large, foamy, acid stools, likened to ice cream, with negative bacterial findings, should suggest the diagnosis.

Tuberculous ulcers in the mouth, on the lips, tongue and inner aspect of the cheeks, pharynx, uvula and tonsils are usually seen in advanced cases of pulmonary tuberculosis. Differential diagnosis of tuberculous ulcers can usually be made by their occurrence at their inception on other areas than the gums, and by smears for acid-fast bacilli from the depths of the lesions.

Carcinomatous leucoplakia may be differentiated not by bacterial findings but by duration of the disease and histopathologic sections. However, clinically a chronic hypertrophic gingivitis may closely resemble carcinomatous changes and tissue studies should be made in doubtful or persistent lesions.

Syphilitic ulcerations can usually be differentiated by a Wassermann reaction and darkfield examination of smears.

Destructive lesions resembling Vincent's may be produced by mercury, arsenic, bismuth or phenolphthalein. In addition, ulcerative gingivitis due to these may be contaminated by the Vincent's organism. In such cases it is frequently noted that the tissue necrosis may be marked and yet the organisms of Vincent may be difficult to demonstrate. This fact may suggest that especial effort should be made to obtain a history of contact with mercury, arsenic or bismuth.

Mycotic infections such as actinomycosis (cladothrix or branching hair) may be differentiated microscopically.

Thrush is characterized by the development of large areas over the buccal or pharyngeal mucous membrane of a thin, furfuraceous, slimy white layer resembling a diphtheria membrane but quite easily detached, and emitting a curious sweetish acid smell. Films stained with Giemsa's stain show the presence of yeast cells, *Saccharomyces albicans*.

The different forms of Leptothrix are easily differentiated by film preparations with 30 per cent sodium hydroxide. A felted mass of "threads like cotton fibers" differentiates this organism. If the sodium hydroxide is allowed to remain for an extended period the organisms may also be digested.

Agranulocytic angina is differentiated from its similar clinical picture, Vincent's angina, by a rapid appearance of a characteristic array of symptoms and a blood count devoid of granulocytes. The organisms of Vincent's are held by many to be secondary. Support for this latter contention is gained from the observations of certain patients in whom the blood picture antedated the mouth lesions.

Acute leukemia likewise may be differentiated by the blood picture. The characteristic clinical features of leukemia may be absent and relationship of the mouth lesion to the systemic disease would be unsuspected without the blood picture.

Infectious Mononucleosis.—Vincent's angina may complicate infectious mononucleosis (glandular fever), but any leucocytosis is said to be polynuclear. Its clinical course, along with the epidemic prevalence, will usually prevent a mistake in diagnosis.

Pemphigus, erythema multiformia and other systemic diseases producing vesicular eruptions in the oral cavity and oral pharynx may be contaminated with the Vincent's organisms, but are only secondary. Lesions of the oral membranes (tongue and buccal), changes induced by chemicals or by electrolysis, from fillings in the teeth, are quite likely to be contaminated by the Vincent's organisms. They may be cured upon removal of the fillings and of foci in the borders of metal fillings. We know that the gums do not attach themselves to metal fillings and there may be infection at their borders which produces the lesion.

INCIDENCE

That the organisms of Vincent's are always present in the oral cavity one can conclude from C. E. Kellett.* He reports finding Vincent's organisms in the tonsils and gums of children starting at the age of one year, a sharp rise in numbers at the ages of five, eight and nine

*Arch. Dis. Childhood, 72:263, 1912.

years, and again at eleven years in one hundred and sixty-eight normal children. These are years of dentition, decay and replacement of the dental set and may be the reason for the rise in the number of organisms. In the study of acute leukemia in childhood he found little support for the idea that Vincent's is a precursor, but regarded this organism as a secondary invader in agranulocytic angina, infectious mononucleosis and the acute leukemias.

Henry H. Lichtenberg, of New York, Marie Werner and Ester Volckmann Lueck* found Vincent's in 45.4 per cent of 108 children before tonsillectomy, and 91 per cent after tonsillectomy from the membrane of the tonsil bed. Injection of sulpharsphenamine before tonsillectomy did not cause a lessening of the number of organisms found after tonsillectomy in a group studied. Vincent's organisms were found in every mouth about spongy gums, in pyorrhea alveolaris, ulcerative stomatitis, angina, tonsillitis, diphtheria, scarlet fever, stomatitis due to bismuth, syphilitic ulcers, noma, ulcers of the bronchial mucosa, bronchiectasis, in tuberculosis, neoplastic, spontaneous and postoperative lung abscess, and so on.

Larson and Baron* say:

"It seems improbable that these organisms play the determining role in the causation of these conditions. It would seem more probable that they are saprophytes and opportunists growing on lesions produced by other agents and only rarely, if ever, becoming pathogenic."

Following the return of soldiers from camps at the close of the late War the literature was flooded with reports of "trench mouth." We have noticed in our private and clinic practice that waves of infection occur. We were able to trace infection in eleven young men from one "party girl," yet we see other instances of man and wife, one a chronic Vincent's carrier, having acute outbreaks, the other clinically free of the disease.

With this evidence, should children be refused schooling during periods of acute Vincent's infection or should they be allowed to attend classes? Personally I believe the patients should be reportable to the school authorities and they should be semi-isolated until clinically well. Some city school boards do cause Vincent carriers in the acute stage to be isolated.

*J.A.M.A., 100:10, 1933.
*Jour. Infect. Dis., 13:429, 1914.

TREATMENT

Our first thought in treatment is to consider the destructive nature of the disease at hand and the fact that necrotic tissue seems necessary for its further penetration. Local treatment should consist in applying oxygen-liberating drugs so that free oxygen attacks the active process. In order that this may be accomplished the oxidizing agent should come into intimate contact with the deep fissures of the lesions. This is not easily done when we use drugs such as silver nitrate, phenol, chromic acid or drugs that produce an obstructive film shielding the organisms. The same is partially true of glycerine or glucose when used as a vehicle. A mixture of equal parts of saturated solution of sodium bicarbonate and peroxide of hydrogen will afford a means of removing necrosed films and releasing oxygen. Dry sodium perborate rubbed into the lesions liberates oxygen. Permanganate of potassium solution (20 per cent) is applied with a dropper in the gingival crevices and removed with peroxide of hydrogen.

In opposition to current literature on the subject of treatment, we have observed that the dentists who treat the local lesions most successfully accomplish their good results by a thorough cleansing of the mouth, removal of all poorly opposing dentures, removal of crowns and the polishing of all roughened surfaces, whether overhanging fillings or eroded teeth. All tartar is scaled and pockets of necrotic tissue between teeth and in the gingival margins are mechanically cleaned and packed. After the application of such drugs as permanganate of potassium, bicarbonate of soda and peroxide of hydrogen, wicks of balsam of Peru are packed into the denuded lesions for an hour. The patient is instructed to take care not to infect other members of his household, to rub the powdered sodium perborate into the lesions and remove with the sodium bicarbonate-peroxide of hydrogen mixture. One should not overtreat the local lesions after they have been well cleaned.

What is the role of the physician? To diagnose internal causes such as avitaminosis, decreased gastric acidity, the treatment of accompanying anemia, and the administration of antispirochetal agents. Such a close relationship between pellagra, scurvy and avitaminosis is found in a Vincent infection of the mouth, that agents which tend to help these diseases aid in curing Vincent's.

Avitaminosis is treated by the addition of brewers' yeast, fruit juices and cod liver oil to the diet. Dilute hydrochloric acid before meals is advised for patients with furred, coated or denuded tongues. Patients with painful mouths and tender tongues are benefited by ox gall given once or twice as a mouth wash and internally in 5 grain capsules three times daily for several days. Neoarsphenamine may be given intravenously to patients whose tonsils are involved. Bismuth, formerly as the thiobismol, was given in the glutal muscle, but such untoward reactions have resulted that the use of this drug has been discontinued. At present bismuth salicylate in oil is used.

Patients with both Vincent's and diphtheria are treated locally, as above, and adequate doses of diphtheria antitoxin are given.

Whole or citrated blood transfusions are given to acutely ill or anemic patients. Treatment must be painstaking and sometimes has to be continued for several weeks.

The bugbear of refraining from minor surgical removal of foci, such as scaling or removal of crowns, and the application of drugs which destroy live tissue should, in my opinion, be erased from the every-day text.

CASE REPORTS

Mrs. G., a white woman, aged 36, a matron in the interns' home, suffered from local gingivitis of a chronic form. She had been treated locally by several dentists and had been given neoarsphenamine intravenously, with no lasting results. The Vincent's organisms were present in pure cultures. All findings clinically were negative except the whitish gingival and buccal film of avitaminosis. Orange juice, brewers' yeast and dilute hydrochloric acid were given in large doses. Red meats were added to her diet. One filling was removed which had obscured an adjacent cavity and a few applications of balsam of Peru pads over the inflamed gingival borders effected a permanent cure.

Mrs. M., a white woman, aged 41, was operated upon for removal of uterine fibroids. Several days following this operation her mouth presented all the symptoms of an acute advanced Vincent's infection. She was unable to take nourishment and had become moribund. Vincent organisms had been demonstrated from the large plaques or denuded membranes over the oral and buccal membranes. Her bleeding and clotting time had decreased, there was a lack of blood platelets and deficiency of erythrocytes. A carefully studied smear of a membrane showed a delicate leptothrix, which we considered a saprophyte. The patient was fed by a duodenal tube, the mouth swabbed out twice daily with an aqueous solution of ox gall; 5 grains were given by tube three times daily and daily blood transfusions from different donors were given. The recovery was rapid and the lesions in the mouth healed without further local treatment.

SUMMARY

(1) Vincent's organisms are present at the age of one, many at five, eight and nine years, and many at eleven years.

(2) The disease has not been consistently produced in experimental animals without devitalizing the tissues.

(3) The foci of organisms must be removed to cure the disease.

(4) A dentist is the co-partner in all cases involving the oral cavity. One of our associates packs the healing tissues with balsam of Peru wicks for an hour each day after removing the film exudate.

(5) Underlying devitalizing diseases must be treated to effect a cure.

(6) The organisms are often found in lesions produced by arsenobenzol or bismuth stomatitis.

(7) Two short case histories are included to show the importance of diagnosis of other existing diseases in the treatment of Vincent's infection.

DISCUSSION (*Abstract*)

Dr. Francis P. McCarthy, Boston, Mass.—I am in charge of the course in Oral Medicine at Tufts College Dental School and have had an opportunity of seeing a large number of Vincent's cases for the past several years. There are two general types of the disease: one that is seen and treated by the medical man and is confined frequently to the tonsillar region, floor of the mouth, and rarely on the tongue. It is characterized by an acute gangrenous process, with the production of a foul odor, the process tending to travel very rapidly and extending deeply into the tissues in a matter of a few days. This type of infection is the classical Vincent's angina which was rare before the War, increased rapidly after the War, and has again diminished in frequency in the past few years.

It is best treated by the application of a strong chemical solution applied deeply into the tissues, using preferably 5 per cent chromic acid, which seems to be effective in practically all cases. It is rare that more than two or three applications are necessary in a given case, and the process granulates in rapidly.

The second group, the gingival type of the disease, is essentially a dental problem and is best treated by the dentist. The condition in these cases is frequently complicated by local mechanical conditions and the removal of the irritating factor, particularly the tartar, is important. The application of soothing remedies with particular attention to the general health usually results in the disappearance of the lesion. However, most of these cases tend toward chronicity and represent a real problem in therapy.

The Vincent's organisms are frequently secondary invaders in many other oral inflammatory lesions and one must not depend on the bacteriological examination alone in arriving at a diagnosis. I am of the opinion, however, that these organisms do definitely produce

a necrosis followed by primary gangrene, but the general lowered resistance of the patient is the predisposing factor toward infection.

Fortunately the disease, at least in the New England section of the country, is tending to decline and it probably will be again as rare as before the War.

Dr. Dudley C. Smith, University, Va.—The omission by the essayist of discussion of antimony injections in the treatment of Vincent's infection is surprising. Tartar emetic intravenously has been used with success for a number of years. Recently in our clinic we have used fuadin, an antimony preparation recommended by Williamson in the treatment of granuloma inguinale. This latter preparation is given intramuscularly with no immediate reactions.

The majority of cases of Vincent's infection of the mouth require only local treatment and a balanced diet to produce a permanent cure. Spraying of the infected area with hydrogen peroxide and a penetrating antiseptic with fairly high pressure is much more effective than the usual mouth wash.

Dr. Van Studdiford (closing).—My idea of trying ox gall for some of my patients followed a suggestion of Drs. Engman and Mook. They had recommended its use in treating burning, tender tongues.

THE DEVELOPMENT OF CUTANEOUS MELANOMA*

By CHARLES PHILLIPS, M.D.,
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This is a clinical and pathological study of melanoma, a neoplasm about which in recent years interesting controversy has taken place, but which is not entered into at this time.

As used here, the term melanoma covers a primary malignant tumor the chief feature of which is the presence of more or less undifferentiated melanoblasts or chromatophores which may produce melanin in varying amounts. These cells have the ability and tendency to invade adjacent tissues and to metastasize early. It is common experience that a fully developed melanoma is one of the most dangerous of neoplasms, but unfortunately at this time we do not know why. This study covers a sufficient time to indicate some prominent features of the life history of melanoma, its clinical occurrence, behavior, and end-results. Only cases primary in the skin are considered here.

For many years, and even now, the term melanosarcoma covered the tumor group characterized by melanin and great malignancy. The histogenetic tissues were mesoblastic in origin, with covering epithelium involved subsequently. Later, the conception that this tumor was derived from cutaneous epithelium gained popularity and pathologists rather generally used the term melano-epithelioma. More recently we note the rise of the conception that the nevus is probably of nervous tissue origin or relationship. Hence melanoma developing commonly in a nevus is also of the same genesis. Highly respected opinions as to this controversy are available on both sides, and this division of opinion will surely lead to greater precision in diagnosis and classification. In the present writing no side is taken with either group, but knowledge of the experience of others has greatly helped in the detailed histopathological studies.

The nevus is both congenital and acquired. The author does not know whether to classify it as a malformation or new growth, but it is certain that the occurrence of melanoblasts in a nevus is of potential importance to the patient. Just where they come from, how they develop, whether or not they produce melanin always, how they develop melanin and its effect on the neoplasm are fascinating questions, but frankly side-stepped here. Experience shows that some melanomas of low malignancy closely resemble fibroblastic processes and especially neurofibroma. The same cells may recur or even spread remotely with assumption of different form and function. Other nevi changing to melanomas closely resemble epithelial tumors, and it would be easy to call them melano-epitheliomas. In my experience the relationship to nervous tissues is less easily seen and not fully established.

The remarkable ability of melanoma to metastasize early raises the question of how these cells spread. For the present let us pass that by also, but not before expressing the conviction that blood vessel invasion, which has been demonstrated frequently, is an important route of colonization. Subsequent detailed study may solve this problem. Regional lymph nodes are usually involved first, but this is often only the beginning even though thorough surgical block dissection may be carried out. It is not uncommon to see much melanin in the primary skin lesion with little in the metastatic ones, or vice versa. The writer recalls two autopsies in which innumerable black melanomatous nodules were present everywhere with an insignificant brown nevus on the arm as primary lesion in one case, while in the second no primary lesion was ever established. It is not uncom-

*Read in Section on Pathology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

mon for these highly malignant growths to kill in about a month with generalized spread.

The material upon which this study is based has been taken from the records of the Scott and White Hospital and covers the period from 1920 to October 1, 1933. Each case has been studied in detail and pathological restudies made. Follow-up work has given a very accurate account of most of these patients, though some could not be traced. We present here the clinical-pathological coordinated study of eighty-eight cases of melanoma. The group naturally falls into two classes: seventy-two upon which surgical removal of tissue allowed pathological study and sixteen which, because of obvious diagnosis and poor condition of the patient at first examination, were considered inoperable and no tissue was taken for microscopic examination. When tissue has been available it has been graded by the use of the now conventional grades one to four.

For the entire series it was found that 52 per cent were females. Ages varied from nine to ninety years, with 77 per cent developing between thirty and sixty years. Twenty-four separate occupations were listed, but one-half of the patients were found to lead outdoor lives, with farmers in the largest class. Thirty-one per cent reported their primary lesions as occurring on exposed parts of the body. All the group came from the Southwestern states, with the majority from Texas. Tabulation shows that of pre-existent lesions in these patients 93 per cent who reported stated that a mole or nevus was present first. No record had been made of the presence of multiple moles on the patient nor of the type of skin nor color of eyes and hair. Occasionally skin cancer of other types has occurred in a patient, but with no appreciable effect upon the melanoma. Several cases of dark colored skin lesions following directly upon trauma, such as a splinter beneath the skin, were found with melanoma developed at this site. In no case has histological study of these primary lesions been possible. The patients reported that the duration of their primary lesions of whatever character varied from one month to sixty years, with birthmarks leading all the rest. This distribution of duration is so great that an average figure was found of little value.

Although recurrence of a tumor and metastasis have not the same significance, these two developments are here grouped because they were found to be valuable. At first examination, 51 per cent of the surgical group were found with recurrence or metastasis, while 87 per cent of the advanced or non-surgical group showed this. A practical question arising from this concerns the meaning to a physician of the discovery of metastasis at first examination. In our first, or surgical, group naturally there were average conditions, and conclusions here would come nearer giving an answer. This is that twenty-seven out of the seventy-two patients having this condition when traced and found to have died of the same disease showed a death rate of 37.5 per cent. These patients lived an average of eleven months after operation, which was done usually within two days of examination. In the second or non-surgical group, the disease was well advanced, and here in the eleven cases with metastasis at first examination who were traced and found to have died of the cancer, we discover a death rate of 86 per cent. They survived an average of nine months.

A study of the agreement between clinical and pathological diagnosis has been tabulated. The terms melanotic sarcoma and melano-epithelioma were accepted as having the same general meaning as melanoma. In the group of seventy-two patients the examining clinicians recorded their diagnoses before operation, and there was found a total agreement of 55 per cent with final pathological findings. Manifestly, one can only guess the real nature of a suspicious looking mole from gross examination; only a microscopic study will reveal its character. In recent years an improvement in diagnostic efficiency has been noted among our clinicians.

Since a previous mole was found in nine out of ten cases as the source of the melanoblastic proliferation, it was found desirable to consider what may have happened to it to start trouble. Fifty-nine per cent report that plain trauma, repeated irritation or more or less successful attempts at removal preceded the present lesion. Trauma included blows, crushing falls, cutting at shaving. Irritation was largely by rubbing of clothes or scratching by hand. Attempts at removal were by electric needle, pastes, cautery, tying by ligatures, knife excision, radium or x-ray. Among this list are well accredited therapeutic procedures, but disaster followed each. Two recent fatal cases in young men followed modern methods, radium and x-ray. Just why this is true I do not know, but the conclusion is inevitable that in dealing with a nevus, whether suspicious or not, absolute destruction at one time is essential. In our present day of enlightenment surely less than this is highly reprehensible. At our institution for many years

cautery destruction has been practiced, and we believe heartily in this efficient agent.

Re-study of practically all the pathological material in the series of seventy-two cases allows us to grade the tissues as follows. Five cases could not be studied again for various reasons. Of the remaining sixty-seven we find that 14 per cent fall into grade 1; 35 plus per cent into grade 2; 34 plus per cent into grade 3; while 14 plus per cent belong to grade 4. Here no description will be given of the grading process except that in the microscopic picture the degree of differentiation is paramount. It is difficult to classify borderline nevi, and most trouble has been met with in the low grades. Several cases of non-melanotic melanoma were found in this region, but it sometimes occurs that these more or less spindle cell growths change in form in recurrences or metastases and become obvious typical melanomas with pigment. As a grade three tumor is reached we find that the frequency of mitotic figures increases until they are often abundant in a completely undifferentiated process. We have seen several times that in the same patient the degree of malignancy increases in a metastatic nodule over that of the primary growth, a step-up process familiar to students of cancer.

End-results in this series of eighty-eight melanomas have been summarized in a number of ways. The natural division of the cases into two groups will be followed here.

In the first or surgical group there were seventy-two cases. Sixty-two, or 86 plus per cent, have been traced. No exact statistics have been compiled as to the relationship between age and survival, but we find that the general rule for cancer holds in that young people die more quickly, while with advancing years it is likely that a new melanoma will not kill so soon. In our figures we have a person of seventy years dying in about nine months of a grade 1 tumor, but metastasis was found early. On the other hand, we have a patient of seventy living three years after discovered metastasis and a grade 4 malignancy.

Where metastasis or recurrence was recorded at the first examination, our grade 2 melanoma patients survived an average of twenty months, the grade 3 melanomas eleven months, grade 4 seven months. By way of contrast, where no metastasis or recurrence was recorded at first examination the grade 1 melanomas survived five plus years, the grade 2 melanomas five plus years. In grade 3 there was but one survival; the patient lived seven years. Among the grade 4's only one lived for nine months. Now, if we take these patients as they come, the entire group when analyzed as to the grading-survival ratio, it is seen that of those graded the grade 1's survived nine months, grade 2's twenty-seven months, grade 3's ten months, grade 4's six months. Thus it is evident that melanoma, like carcinoma, kills with increasing certainty as cells grade from one toward four.

Among the patients in group 2, where tissue was not available for study, we have already seen that the cases being advanced had a cancer death rate of 86 per cent if metastasis was found present at the first examination. In this series of sixteen cases the traced cases had a final cancer death rate of 75 per cent. They averaged less than a year of life after first examination.

In comparison with general cancer figures we have analyzed the eighty-eight cases to see what the results were for five-year or more cures. There are thirty-seven cases recorded within the five-year period, but six of these were never heard from. There are nine living cases, and three deaths from other causes. This shows that 38.7 per cent of those patients in the five-year period might with reason be called five-year cures.

Another analysis of end-results shows that of the eighty-eight cases of melanoma in this report forty-nine, or 55 plus per cent, are dead, twenty-five, or 28 plus per cent, alive, fourteen, or 16 plus per cent, not traced for various reasons. Of those recorded as dead, 46.5 per cent died of melanoma, giving a death rate of this figure for the entire series.

Tabulation of the kinds of treatment given to those patients shows variation from knife excision, cautery removal, electric spark applications, radium and x-ray administered outside of the hospital to cautery destruction with or without block dissection plus postoperative x-ray therapy used in our institution. No attempt has been made to evaluate kinds of surgery in relationship to end-result, but this study clearly shows the utter inadequacy of treating an early melanoma with less than radical destruction at one time. In more advanced cases even cautery destruction with block dissection has generally been futile. In my opinion the degree of differentiation of the melanoma cells as determined by careful experienced microscopic examination is more important in estimating the future welfare of the patient than the type of surgery selected. The age of the patient will modify the progress of the disease, for in general the older

the person the better the prognosis. We have had no experience in primary treatment of melanoma by radium or x-ray alone, but, judging from the effect of these agents upon some seemingly innocent local moles later developing destructive melanoma, we believe that the principle of complete destruction at the time should be followed.

Along this line let me state most emphatically that this study would be futile if not emphasizing again the great danger of what I call "monkeying" with nevi. Electric needling or sparking and pastes of unknown type along with radium and x-ray are shown by these records to have acted much like detonating caps to dynamite followed by a veritable explosion, frequently with a fatal result. Nine out of ten of these melanomas are described as having definitely followed a primary nevus, usually pigmented. Surely the profession cannot ignore this additional warning that irritation, trauma, and ineffective eradication of melanotic nevi are potential dynamite.

Postoperative irradiation of approved modern type has been used in many of these cases, but without appreciable result. It appears probable that melanoma cells are radioresistant, certainly those of the upper grades of malignancy.

One of the chief objectives of this year's study has been to investigate the problem of the curability of melanoma. It is found here that nine patients lived five years or more and that three more died from other causes. With a single exception these people were fifty years or more of age, but two of them had grade three cancer with extension to other tissues. In general it may be said from this study that for a patient with melanoma to be cured he should be at least fifty years of age, have a low grade malignancy without recurrence or metastasis, and that complete local destruction of his disease should be accomplished. Very few grade 3's get well and practically no 4's unless they are quite old and have efficient treatment. We find that melanoma kills about one-half of its victims regardless of treatment.

CONCLUSIONS

We present a series of eighty-eight cases of melanoma with a clinical-pathological study showing end-results over a thirteen-year period of observation. Forty-six and five-tenths per cent of the group died of melanoma within from one month to several years, usually with recurrence and multiple metastases. Ninety-three per cent of the patients had their cancers develop from previous moles, which were most frequently upon face, neck, or hands and which usually had been subjected to repeated irritation or trauma. "Monkeying" with pigmented moles is found to be highly dangerous. Only a small number of these patients were cured, and when this occurred they were over fifty years of age, had a low grade malignancy, and had efficient destruction of the local lesion. Histopathological grading of melanoma is a valuable prognostic procedure.

A NEW EMPHASIS IN THE TEACHING OF PHYSIOLOGY*

By ERRETT C. ALBRITTON, M.D.,
Washington, District of Columbia

The history of medical education in the past several decades has been one of steady advance toward a more adequate training of the student for the responsibilities and opportunities of his profession. In these years, and founded in the many years preceding them, certain standards of procedure for training the medical student have come to be accepted. There is no question that this type of training results in a product well qualified in most respects to hold high the standards of the medical profession.

No one would maintain, however, that the ultimate good in teaching methods or emphasis among the various objectives in medical education had been reached. Indeed there would seem to be little doubt that further advance will be made. In seeking suggestions for such advance, we may well turn to another type of training that has grown up side by side with that leading to the medical degree. I refer to the graduate type of training, leading to the doctorate of philosophy, and specifically this degree in a medical science.

The graduate student and the medical student follow different routes, but aim for goals that are by no means incompatible. In individual instances, the two paths may lead out on to common ground. There are Ph.D.'s whose interest has led them into fields of such importance to clinical medicine that, were it not for the legal barrier, consultant practice in their specialty would be a perfectly natural next

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*From the Department of Physiology, School of Medicine, the George Washington University, Washington.

step; and there are any number of medical graduates who have gone into investigative work, and have stood shoulder to shoulder with their Ph.D. colleagues in pushing further outward the boundaries of knowledge in medical science. Here, then, is a type of training that has grown up as it were in our next door neighbor's yard, that we may well examine for suggestions to plant in our own.

The graduate student has a large measure of independence and opportunity for initiative in his work, as contrasted with the medical student whose work is characteristically laid out for him in considerable detail. The graduate student sets his own pace; the medical student must adapt his to that of a class. The graduate student has opportunity to repeat his work to secure more adequate data, and to perfect his methods so as to avoid previous mistakes. The medical student knows no such luxury; he must pass on to the next assignment whether previous laboratory results were good or poor.

The graduate student is held strictly to account for adequacy of his data, elimination of unwarranted assumptions from his work, detection and control of associated factors that would otherwise make his interpretation of his results questionable, and for soundness of his conclusions. The medical student is seldom held to standards that are anything like so rigorous in his experimental work. His experiments are looked upon as primarily for the purpose of giving concreteness to ideas from his text that would otherwise be rather tenuous, and for fastening facts more securely in his memory. He tends to show a bias in favor of text or lecture statements in such conclusions as he draws from his work, and to explain away or ignore observations that are not in agreement with these.

In short, however proud we may be of the present high standards of medical education, we must concede to the graduate type of training a superiority in its opportunities for development of initiative, for thoroughness in experimental work, and for development of scientific judgment. As medical educators we may well seek for the medical student a greater measure of these advantages. I am convinced indeed that along this path of development lie some of the greatest rewards available in the further elevation of the high standards of the medical profession.

Should we, in search of these rewards, necessarily introduce original investigation into the medical curriculum, and perhaps require a thesis for graduation? Something can be said in favor of such a requirement, but I shall propose nothing so extreme. I propose nothing further than that, so far as the plan is practicable, the work we now assign the medical student as a task be offered him instead as a succession of problems for solution. This change in point of view will entail no modifications in method that cannot be made within our present teaching set-up, and, put into effect, will free medical teaching from the present restraints that interfere with the development of the graduate characteristics we have discussed. The same work organized into independent problems would have the same simplicity of technic as before. But in the repetition of these problems by each successive student, the same high standards as to soundness of conclusions can be demanded that the original investigator himself is required to measure up to. A medical course whose laboratory sciences were taught from this point of view might well attract men who would otherwise seek training by the graduate route. It would undoubtedly deliver to the medical profession graduates still better equipped to elevate further the present high standards of the profession.

In putting such a plan into effect in the laboratory teaching of physiology in the school with which I am connected, we have made two major changes in method and have associated about these certain other minor changes. We have in the first place broken up the traditional laboratory work in physiology into the simplest possible unit problems, each the demonstration of a single causal relationship in the science; and we have made the students at each laboratory table an independent working unit, as completely divorced in their work as practicable from all other students in the laboratory.

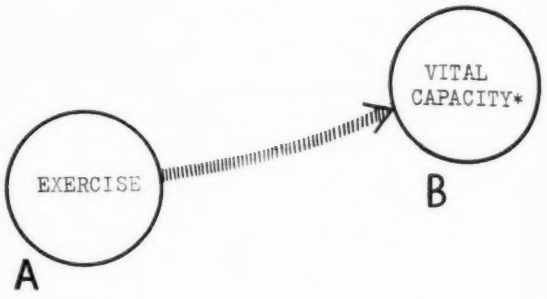
Laboratory work in physiology is characteristically the observation of some variable as affected by different influences brought to bear upon it. A day's work upon mammalian blood pressure is an illustration. In such a study the student, working upon an anesthetized animal, tries the effect of such procedures as saline injection, hemorrhage, stimulation of nerves and administration of drugs. Each procedure, as for example, the testing of the effect of hemorrhage, is a complete simple problem in itself, and can be studied entirely without association with the other procedures carried out on the same animal. Each problem can be formulated as the demonstration of the existence, or not, of a causal relationship between two variable quantities. Over a hundred such unit problems, each consisting of the demonstration of a single

R-20 1

Can. -151 2

R-16, 18, 22 3

V. C. Spirometer or Gasometer (or Douglas bag and meter) 4



5

Man 6

Probability that similar change in B could occur due to its natural variability "chance:" 7

Other factors than A conceivably active to produce observed change in B: 8

B

A 9

The vital capacity is measured before and during (and immediately after) a prolonged standing run, or work at a measured rate on the bicycle.

Here appears to be one of the infrequent instances in which the body fails to make "satisfactory" functional adjustment to a situation. In this case there is a conflict between two demands, one for a larger volume flow of blood in the body, the other for maximum ventilation with minimum effort.

Show how these functions are involved in the results.

PROCEDURE:

1. As above. See Manual for Vital Capacity Technic (C). Determine difference between resting and exercise values in several tests using different subjects.
2. Determine the statistical "significance" of the mean difference (CXL).

QUESTION:

What change in vital capacity in cardiac insufficiency and why?

10

Hours consumed: Animals used: Delays due to:

11. Condition and previous experience of material; 12. Kymograph record and/or tabulated data; 13. Mechanism; 14. Discussion of 7, 8, 13, etc.

*Maximum tidal air.

Fig. 1. Sample of Unit Experiment Sheet.

causal relationship, can be made available to the student for investigation on the anesthetized animal alone, and for the total laboratory course in physiology several hundred may be offered.

The physiology department at George Washington now has a loose leaf library of several hundred unit problems, and expects to add to these from year to year. We encourage the student also to undertake simple experiments of his own devising, such problems being first submitted of course for approval.

The treatment of each unit experiment occupies a separate loose leaf sheet. The front contains the directions for procedure, with certain spaces which the student is required to fill in; the back is left blank for the tabulation of data or pasting of graphs, and for the required details of the write-up.

Here (*Fig. 1*) is a reproduction of one of our unit experiment sheets. The causal relationship in question is that between exercise and vital capacity. In the terminology familiar to students, exercise here is called the "agent variable" and the vital capacity the "affected variable." The change ordinarily found to occur during exercise is a decrease in vital capacity. When the student has made his measurements, he is required to consider first whether or not the natural variability of vital capacity from one measurement to another is sufficient to account for the change observed. The question is stated in this form: "What is the probability that a change in the affected variable of equal extent could occur due to the action of chance alone?" For most of the problems offered the answer is that the probability is negligible, but the exceptions are perhaps frequent enough to prevent the student from writing this answer as a routine matter.

In this experiment repetition of the measurement is not laborious. The student is therefore required to calculate the standard error of the mean difference between the resting and exercise values of vital capacity and to test the statistical significance of the result. Directions for this calculation and for other standard procedures in laboratory work are given in a fifty-page manual of laboratory technic that we issue to each student. Roman numbered references to this manual occur throughout the procedures in the unit experiment sheets.

After the claims of chance have been considered, the student is required to consider next whether or not some other factor was inadvertently changed along with the increase in exercise from its resting value. If such other change has been made, it is listed, in the space provided, as an "associated factor," and discussed as may be necessary on the back of the sheet.

To these formal requirements, safeguarding the validity of conclusions, there should be added the further ones that previous experiments upon the same individual be considered as possible factors in the result, and that the student be on his guard against bias in favor of "expected results" when he undertakes to interpret his data.

A final requirement in such an experiment is an attempted explanation of the mechanism of the causal relationship in the particular case. Here is (*Fig. 2*) an example of what might be accepted from a student as an explanation of the mechanism of the relationship of exercise to vital capacity. An increase in exercise (from a resting level) leads to a similar change in the heart output per minute into the lungs, this to an increase in the distention of the vascular bed of the lungs with blood, and this to an opposite change, a decrease, in the space available for air on inspiration. This last leads to a decrease in the vital capacity. (It is probable that other mechanisms play a part here also.)

The requirements here outlined come as near to holding the medical student's work to graduate standards as seems practicable. There are two other points I wish to emphasize here. We do not require repetition of the experiment to obtain perfect results, though we may advise it in some cases, or permit the student to at-

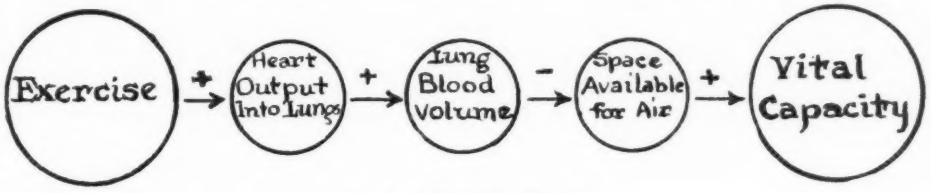


Fig. 2. A Mechanism Diagram.

tempt it if he wishes. And we do not require the student to set up perfectly controlled experiments, as this is not always practicable under ordinary laboratory conditions. We permit him to stop at the stage of the original investigator who may have made one or two trials with reasonably careful methods. Such an investigator may have found that his demonstration of the causal relationship under these conditions was imperfect. We expect the student to know in a similar way the imperfections of his experiment, what factors remain to be controlled, and whether the data he has been able to collect are adequate for a conclusion.

I shall discuss only briefly the remaining modification of our method, the freeing of each laboratory team from consideration of what others in the laboratory are doing. It should be apparent that such freedom will contribute materially to the success of the plan so far outlined. It is not alone in the crafts that individualism as contrasted with mass production leads to the highest type of work. The student not only has the opportunity to repeat work for more perfect results, if he so desires, but working at his own pace, unhurried by others if he is slow, not held back by others if he is able to do faster work, busy on a problem of his own choice, he can get some taste of the freedom of the graduate student, and the stimulation of interest that such freedom to work upon self-chosen tasks and opportunity to do them well is sure to bring.

Before entering upon the free choice of his own laboratory problems, the student is given a period of training in the use of the various combinations of laboratory apparatus that are applicable to different problems. In this period of training, which is given to the whole class, the student performs one or more of the most important experiments for each of the laboratory technics taken up. He thus is given a short basic course of assigned work.

By the time the student enters the period of elective work, which consists of about two-thirds of the total laboratory time, he is prepared to begin work in any of the divisions of the subject ordinarily treated in the laboratory. He signs up in advance for special apparatus and animals required; makes a daily report of the unit experiments successfully completed that day, and of those that he intends to undertake in the next laboratory period. As soon as he completes a write-up of an experiment, he submits it to his instructor for acceptance or criticism. No set number of experiments is required for the course, and no grade is given for numbers alone. The student understands that he will receive more credit for 50 unit problems perfectly done than for a hundred done poorly.

In conclusion, I should emphasize again the essential purpose of the plan, namely: to introduce graduate characteristics into experimental laboratory teaching. The plan has been in practice in successive stages of its development for a period of several years. The students work just as hard under this plan as under the ordinary method of teaching and accept readily the advice of their instructors in the matter of a wise balancing of time devoted to the different subjects available. Students may find adjustment temporarily difficult in individual instances when they are faced with the necessity of exercising some thought in the direction of their own activities, but on the whole they show a gratifying appreciation of the aims of the exacting quality of work demanded.

DISCUSSION (*Abstract*)

Dr. Earl B. McKinley, Washington, D. C.—The teaching of physiology, as outlined by Dr. Albritton, has interested me very much in our school as an experiment involving a basic course with elective experiments in the laboratory superimposed upon the basic required experiments. We have encouraged Dr. Albritton to attempt this sort of experiment as a method of giving the student some selection in laboratory experiments with the fundamental idea of encouraging thinking and seeking for information rather than merely receiving it. It is yet too early to evaluate the results of the experiment, as Dr. Albritton has said. Fortunately, this subject, in which many experiments are available, lends itself admirably to this type of experimentation in a teaching method.

Dr. Albritton (closing).—Whether or not the method is suitable for other subjects I am not in a position to say. Physiology is in a peculiarly favorable position for such a method of teaching, in view of the very large excess of important material available for laboratory experiments.

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COAL TAR DERIVATIVES AND CARCINOMA OF THE BLADDER

Among the various irritants which have been employed to produce cancer in animals, the best known are the coal tar derivatives. From coal tar a great number of useful organic chemicals are obtained, among them explosives such as T.N.T. or trinitrotoluol, paints, dyes, cleaning fluids such as benzene, disinfectants as phenol, aniline, naphtha and its derivatives, and medicaments popular in recent years, such as acetyl salicylic acid (aspirin), acetanilid, and many others.[1]

Dinitrophenol, a benzene compound, has been widely publicized in the past two years because of the discovery that it is a metabolic stimulant, with many of the physiological properties of thyroxin.[2] It produces an increase in the basal metabolic rate and temperature and causes a weight loss in a degree proportional to the amount taken. The patient may be slowly cooked if he ingests enough dinitrophenol. Another coal tar product whose effects resemble those of a hormone is dibenzanthracene.[3] Its formula is very much like that of folliculin, the ovarian hormone, and it has the systemic effect of folliculin, in that it induces estrus or heat in castrated animals. Dibenzanthracene is also one of the most potent carcinoma producing substances known.[3] Some of the crude coal tar products are active in inducing carcinoma if painted on the skin of animals.[4] There is a high incidence of skin carcinoma among workers in the heavy coal tar industries.

Among dye workers in Germany in 1912, carcinoma of the bladder was reported to be thirty-three times more common than in the whole population.[1] Throughout this century the development of bladder tumors in dye workers has been very extensively studied and elaborate steps have been taken to trace and control it. The bladder tumors are believed to be caused by inhaling fumes of toxic substances, which later are excreted through the bladder. It is difficult to tell which of the many coal tar products used in the manufacture of dyes is causative, since chemicals of similar formula but very varied physiological effect are involved. In the opinion of Gehrmann,[1] of du Pont de Nemours & Co., *alpha* and *beta* naphthylamine ($C_{10}H_7NH_2$) and benzidine are chiefly suspect. Aniline is in other countries believed culpable. Aniline is a very penetrating oily substance which on contact with the skin rapidly enters the blood stream and induces toxic effects. Gehrmann considers *beta* naphthylamine more dangerous than the *alpha* product, though their structural formulas are almost identical.

The formulas of the naphthylamines differ merely in the position of the amino or NH_2 group in the benzene ring. This slight structural change results in a compound of enormously increased toxicity, the *beta* product being according to Gehrmann the dangerous one.

The dye industries have undertaken the prevention of bladder tumors in exposed individuals, first by attempting to manufacture the dyes within a closed system: that is, to hold the material in pipes and containers which allow no fumes or dust to escape to be inhaled by the workers. In addition, the du Pont Company is requiring a routine cystoscopic examination of applicants for the so-called dangerous positions. Cystoscopic examination at three-month intervals during the time of their contact with dyes, and thereafter for life if possible,

1. Gehrmann, G. H.: The Carcinogenetic Agent—Chemistry and Industrial Aspects. Jour. Urol., **31**:126, Feb., 1934.
2. Editorial, Dinitrophenol. Sou. Med. Jour., **27**:63, Jan., 1934.
3. Ferguson, R. S.: Etiology of Bladder Carcinoma. Jour. Urol., **31**:122, Feb., 1934.
4. Kennaway, E. L.: Experiments on Cancer Producing Substances. Brit. Med. Jour., 3366, July 4, 1925.

is advised. No tumor has been detected in a dye worker after less than two years of exposure; tumors have occurred, however, as late as thirty-five years after termination of the individual's work with dyes. They are reported to have occurred in about 4.5 per cent of those working with dyes. In more than half of the cases no symptoms suggestive of bladder tumor were noted before cystoscopy. Nearly 95 per cent of dye workers, of course, handled the materials without developing any bladder disease.

These industrial bladder tumors have offered quite an opportunity for the study of the development of a malignant growth in human beings. Among the tumors reported, every type of growth has been observed, from benign papilloma to carcinoma of the most malignant grade. Areas of irritation, or hemorrhagic areas, developing in previously normal bladders, have been rather common.[5] Anderson,[6] in cystoscopic examination of five hundred-odd dye workers, noted that 19 per cent had some irritation or congestion of the bladder, with or without hemorrhage.

The early dye workers cannot be considered a selected group. They are probably representative of the population as a whole, and probably had no particular predisposition to malignancy. The development of the bladder tumors may be taken as due solely to long periods of exposure to small quantities of the irritant materials. The same irritants have in some cases resulted in local congestion and hemorrhage, in others in benign or malignant growths, in most in no disturbance at all, the duration of exposure and the susceptibility of the individual being interrelated causes.

Preventive measures in this type of growth have apparently been remarkably successful. The "cure" rate is also encouraging. Washburn,[7] in a series of twenty-three industrial cases treated, reports only one death. Burnam,[8] of the Howard Kelly Hospital, in a series of two hundred and nine (not industrial) bladder tumors definitely diagnosed as malignant, was able to secure 21 per cent of cures.

5. Gay, Douglas M.: Pathology of Anilin Tumors of the Bladder. Jour. Urol., **31**:137, Feb., 1934.

6. Anderson, L. W.: Incidence, Symptoms and Signs. Idem., p. 148.

7. Washburn, V. D.: Treatment of Anilin Tumors of the Urinary Bladder. Idem., p. 155.

8. Burnam, C. F.: Treatment of Malignant Epithelial New Growths of the Urinary Bladder. Sou. Med. Jour., **26**:136, 1933.

A NEW TREATMENT FOR OSTEOMYELITIS

During the War, according to Baer,[1] of Johns Hopkins University, wounds which were well cared for often suppurated extensively, while totally neglected fly-blown cases in which maggots had hatched, healed in a short time with a minimum of disability. It was suggested by Baer[1] that the maggots destroyed the invading bacteria and at the same time removed the devitalized tissue without injuring the healthy portions of the wound. He subsequently conducted extensive experiments to prove their effectiveness. Baer's maggot treatment of osteomyelitis is known the world over, and has apparently had considerable success. Maggots are now cultured and supplied by various pharmaceutical houses. It is sometimes difficult to keep them in the wound or to prevent them from drowning in the discharge. There are, of course, obvious esthetic and other objections to the treatment, among them being the possibility of introducing tetanus into the wound. There have been various attempts to secure the antiseptic activity of the maggot without its living body. Improvement has been reported in cases of osteomyelitis inoculated with a bacteriophage, and it has been suggested that the benefits from maggot therapy are actually due to a bacteriophage. Livingston and Prince,[2] in 1932, reported the extraction of a bactericidal substance from crushed maggots. They used it with and without maggots in a number of cases of human osteomyelitis and observed good results. The extract had the advantage of being relatively sterile and of neither growing nor crawling in the wound.

Stewart,[3] a doctor of philosophy of Houston, Texas, attempted to discover whether a simpler substance, possibly something excreted by the maggots in their growth, might have a curative effect in the osteomyelitic wound. He therefore studied the composition of the larva. It is known, says Stewart, that maggots have in their bodies a large quantity of calcium carbonate. This, he found, is exuded through the wall. The calcium ion stimulates phagocytosis. Calcium carbonate exuded into the wound by the mag-

1. Baer, W. S.: The Treatment of Chronic Osteomyelitis with the Maggot. Jour. Bone & Joint Surg., **13**:438, 1931.

2. Livingston, S. F.; and Prince, L. H.: Treatment of Chronic Osteomyelitis, with Special Reference to Use of Maggot Active Principle. J.A.M.A., **98**:1143, 1932.

3. Stewart, M. A.: A New Treatment of Osteomyelitis. Surg., Gyn. & Obst., **58**:155. Feb., 1934.

gots has, therefore, he believes, the same effect. It should aid the natural body defenses and could perhaps be substituted for the maggots themselves in the treatment of osteomyelitis. The infecting bacteria, however, excrete a leucocidin, or white cell destroyer, which kills the phagocytes as soon as it comes in contact with them. He considered that he needed, in addition to the calcium carbonate to stimulate the phagocytes, something to prevent the bacterial leucocidin from destroying them. Picric acid in dilute solution he thought might serve this purpose. Picric acid, however, did not penetrate the crevices of the wounds as completely as was desired. To the picric acid solution he therefore added a little glycerin to reduce the surface tension and permit penetration of the crypts and crevices of the wound. Calcium carbonate to bring the phagocytes to the scene, picric acid to inactivate the leucocidins or destructive forces of the bacterial army, and glycerin to make the picric acid solution "runny," or penetrating, constituted the treatment. It is to be hoped that each of these pharmaceuticals did exactly what was expected of it and nothing more. Laboratory animals were experimented on and good results were obtained; forty-one human cases treated by this method were likewise reported, with good results in most.

In treating human cases, the necrotic bone was first removed surgically, the wound was packed for twenty-four hours, then irrigated with the picric acid-glycerin solution. Shortly after, the aqueous calcium carbonate suspension was sprayed into the wound. In every case, the rate of drainage increased. The calcium picrate formed had analgesic properties grateful to the patient. Treatments were given about three times per week, or oftener. Granulation and healing were usually rapid, and the type of granulation tissue formed was reported as smooth and glistening, with a sheen which is specifically characteristic of maggot therapy. A shorter duration of treatment and reduction of the amount of scar tissue are claimed.

The method is obviously, if it accomplishes the desired results, more convenient and agreeable than the maggot technic. A number of unproven hypotheses must be accepted to uphold the author's explanation of the effects.

GLEANINGS FROM RECENT JOURNALS

Morphine in Intestinal Obstruction.—Although opium is undoubtedly one of the most valuable drugs which the surgeon has in his armamentarium, say Ochsner, Gage and Cutting,[1] working at Tulane University, many men use it sparingly after operations. It has a constipating effect which is generally thought due to its inhibition of intestinal activity. Its use in peritonitis has been recommended because it is believed to "splint" the bowel and thus prevent the spread of infection. The New Orleans investigators have over a period of years studied the effects upon experimental intestinal ileus, of various hypertonic and hypotonic sugar and salt solutions, insulin and other drugs. Injections of hypertonic sodium chloride and Ringer's solution, they report, are beneficial; after pituitrin there is a decrease in intestinal tone and peristalsis.[2] They have recently investigated the effect of morphine injections on the obstructed gut; they report that, contrary to the general opinion, opium derivatives stimulate rather than inhibit the activity of the small intestine. Morphine in no way favors ileus. Administration of morphine is, therefore, they say, beneficial in obstruction, and morphine may be freely used postoperatively.

Skin Disorders after Pancreatectomy.—There are many experimental methods of making a laboratory animal lose its hair. Several specific dietary restrictions have had this result. During vitamin A defiency, a defective coat of fur, scaliness of the skin and sores are noted among other symptoms. Rats lose the hair above the eyes and shoulders on a G-deficient diet. Lack of the essential fats, or addition of oxidized fats, can produce the same symptoms; and investigators at New York University[3] report a similar loss of hair, scaliness and skin sores, in dogs from which the pancreas has been removed.

In these animals they have attempted to prevent or relieve the abnormalities of the skin by various modifications of the diet. The livers of their dogs contained relatively small amounts

1. Ochsner, Alton; Gage, I. M.; and Cutting, R. A.: Effect of Morphine on Obstructed Intestine. Arch. Surg., **28**:406, Feb., 1934.

2. Ochsner, Alton: Acute Intestinal Obstruction. Sou. Med. Jour., **24**:93, 1931. Editorial, New Orleans Meeting, Sou. Med. Jour., **24**:1125, 1931.

3. Ralli, E. P.; Flaum, G.; Joffe, P.; and Stueck, G.: Further Observations on the Vitamin A Content of the Livers of Depancreatized Dogs. Amer. Jour. Physiol., **107**:157, Jan., 1934.

of vitamin A. They therefore considered it possible that in the absence of the pancreas the liver was unable to store this essential accessory food. Vitamin A was added in considerable quantities to the ration, and some of the depancreatized dogs stored it in abundance in their livers, as was demonstrated by chemical tests. The symptoms, however, were not improved. A number of variations of the standard dietary, including the addition of yeast, raw liver, lecithin, cystine, milk powder, as well as codliver oil, were tried, without relieving the skin disturbance. The abnormal hair loss, scaliness and skin sores were not improved. The correction of these dermatological disorders by insulin injections is not discussed.

Symptoms of dietary deficiency thus may be produced either by omission of an essential food element from the dietary or by injury to an essential organ which prevents the proper utilization of one or several nutritive elements.

Diagnosis of Trichomonas Vaginalis.—Infection with *Trichomonas vaginalis* is usually determined by the examination of a fresh hanging drop of vaginal mucous secretion. Ewing and Le Moine,[1] of New York, describe a method of staining this micro-organism with dilute carbol fuchsin, which eliminates the necessity of examination of the specimen as soon as it is secured. They report greater clinical convenience and also an increase of accuracy in the diagnoses by this technic.

TWENTY-FIVE YEARS AGO

FROM JOURNALS OF 1909

No Spitting in Canada.—"Recently in Montreal fourteen young men were fined, and eight were given an option of a fine of $3.00 and costs or thirty days in jail for violation of the anti-expectoration ordinance."[2]

Hot Water and Postpartum Hemorrhage.—"The proverbial ingratitude of patients is illustrated by the following case in which a woman brought an action against her physician for doing a thing which probably saved her life. * * * Drs. J. A. Mearns and W. J. Bryce were each sued for $625 damages for alleged negligence in treating her during her confinement. She was scalded by the injection of hot water used to check postpartum hemorrhage. The sheriff in giving judgment remarked that it was a most painful case to decide in consequence of the mutual aspersions of the parties."[1]

Cause of Goiter.—Dr. William D. Haggard,[2] of Nashville, said: "It has long been supposed that goiter bears a causal relation to the water supply, and it has been found that if the water is filtered, it depreciates the incidence of goiter. Of 13 individuals who took the filtrate, 4 contracted goiter. It was afterward observed that if the same filtrate were boiled for ten minutes the patients to whom it was administered would not develop goiter. Therefore there is undoubtedly in the sediment some bacteria with which we are not yet acquainted, and which may bear a causative relation in the production of goiter."

Oatmeal in Diabetes.—"The feeding of diabetics with large quantities of a single carbohydrate (oatmeal, rice, potato, milk) has been practiced with occasional success for many years; when carefully controlled and when employed in properly selected cases this method is a useful and often indispensable adjuvant to the treatment; when applied promiscuously it is dangerous. * * *

"In older individuals it requires an immense amount of will power to live for days on the oatmeal porridge given every few hours with nothing to relieve the monotony but a little black coffee or some claret, whiskey, or brandy and water. * * *

"The most brilliant results are obtained in children. * * * In cases of diabetes of longer duration children below 15 years * * * do not fare so well. * * * Of eleven children * * * seven have succumbed to coma, one to intercurrent tuberculosis, three are still alive, but none of them sugar-free."[3]

Spelling as an Index to the Preparation of the Medical Student.—Dr. George Dock[4] said: "For many years I have collected certain data bearing on the preliminary education of medical students, * * * chiefly in examination books of medical students in their third year. * * *

"Most of the examples I cite * * * occur in

1. Ewing, R. E.; and Le Moine, M.: The Diagnosis of Trichomonas Vaginalis Vaginitis. Surg., Gyn. & Obst., **58**:192, Feb., 1934.

2. Medical News, Canada. J.A.M.A., **52**:1343, 1909.

1. London Letter. J.A.M.A., **52**:1343, 1909.

2. Haggard, W. D.: Discussion, Surgery of the Thyroid. J.A.M.A., **52**:1350, 1909.

3. Croftan, A. C.: Some Experiences with the Oatmeal Diet in the Treatment of Diabetes Mellitus. J.A.M.A., **52**:1313, 1909.

4. Dock, George: Spelling as an Index to the Preparation of the Medical Student. J.A.M.A., **52**:1176, 1909.

some books in every class. * * * The most flagrant examples are the following:

"Aery for area
"Anamil
"Antiseptic
"Arrose
"Bowals
"Bowles
"Larnyx
"Ulseration
"* * *

"For Widal: Widall, Weidal, Wedol

"For Koplik: * * * Koplick, caplex, Koplig, Kolpig, Poplik.

* * * "Almost without exception, the student who writes 'cracentic' or 'crescentric' does not understand the real characteristics of a 'crescentic' eruption; the one who writes 'Koplik' as given above never knows when and where 'Koplik spots' occur, how they look or what they signify."

The Laboratory as an Aid in Diagnosis.—"If the general practitioners would avail themselves of these methods of precision coming from chemical laboratories and microscopical findings, few cases of illness would go undiagnosed and few sufferers lose the benefits of modern medicine."[1]

1. Editorial, The Laboratory as an Aid in Diagnosis. Sou. Med. Jour., **11**:657, 1909.

Book Reviews

The 1933 Year Book of General Surgery. Edited by Evarts A. Graham, A.B., M.D., Professor of Surgery, Washington University School of Medicine; Surgeon-in-Chief of the Barnes Hospital and of the Children's Hospital, St. Louis. 826 pages, illustrated. Chicago: The Year Book Publishers, 1933. Cloth, $3.00.

Surgical literature during the past year bears out the premise that ether is the safest anesthetic for general use. The first cases of ether convulsions in this country are reported by J. S. Sears in this volume. They are likened to those of insulin hypoglycemia. M. H. Manson has found in 11 per cent of old chronic ulcerating lesions, gas gangrene bacilli. He warns the profession of the likelihood of gas gangrene in amputations in these patients. The section on malignant tumors contains many references to malignancies of the lungs. There are also found in this section a few references to the long survivals after cancer operations which were related before the American College of Surgeons. In fractures, local anesthesia is becoming more common, the main objection being the danger of going into a sterile cavity. Lockwood and Stewart show skiagram studies of the female breast and point out the value of this method of diagnosis. The present status of lung surgery is brought out by a large number of abstracts. Appendicitis has again become the subject of popular discussion as evinced by the large number of papers. The injection method for treating varices is accounted the safest by G. Janz. The emphasis in this volume has been placed upon the collecting of abstracts that the American surgeon will not find easily accessible. The general practitioner will find many diagnostic hints that will well repay him for the time spent in reading this book.

The 1933 Year Book of General Medicine. Edited by George F. Dick, M.D., Lawrason Brown, M.D., George R. Minot, M.D., S.D., William B. Castle, M.D., William D. Stroud, M.D., and George B. Eusterman, M.D. 831 pages, illustrated. Chicago: The Year Book Publishers, Inc., 1933. $3.00.

The abstracts express the tendencies of progress in the field of medicine. The section on infectious diseases shows a growing usage for scarlet fever antitoxin. Tularemia has reached international importance, cases being recorded practically all over the world. In treating tularemia Foshey's serum and neoarsphenamine seemingly offer hope. Whooping cough and varicella are stated by several authors to be diseases of old age as well as childhood. The sedimentation rate is being used more extensively as a means of determining latent and chronic infection.

The gold salts are being given wider trials in the treatment of tuberculosis. Some authors believe that bovine tuberculosis may be mutated by this means to the human type. The volume contains many papers on the increased popularity of collapse therapy in the treatment of tuberculosis. A paper on four-year asthma cures is very enlightening, as only 12 per cent of the cases remained cured. The immediate typing by means of the Newfield reaction should serve as an impetus for more critical results in the treatment of pneumonia.

The interest in rheumatic fever as a cause of heart and blood vessel pathology has not waned. Coronary occlusion is the subject of a large number of articles. Marvin elaborates the rule, "if a patient can lead a normal life without symptoms, the heart and circulation will almost certainly stand anesthesia and operation." This book is an excellent reference for any practitioner.

Behind the Screen. By Maurice Chideckel, M.D., Baltimore, Maryland. 275 pages. New York: The American Medical Publishing Company, 1933. Cloth.

This is a cynical account of a medical practitioner's day-to-day experience with his patients, most of whom seemed to be afflicted with some form of sexual neurosis. Those who were so fortunate as to be free of a sexual complex were evidently much below the average in intelligence. The book is written in the form of a diary which covers the activity of the author for a year. After reading it, with much difficulty at times, one feels that neither the world of literature nor medicine would have suffered if these experiences had been left permanently "behind the screen."

The 1933 Year Book of the Eye, Ear, Nose and Throat. The Eye by E. V. L. Brown, M.D., Professor of Ophthalmology, University of Chicago; Attending Ophthalmologist, St. Luke's Hospital, Chicago, and Louis Bothman, M.D., Associate Professor of Ophthalmology, University of Chicago. The Ear, Nose and Throat by George E. Shambaugh, M.D., Professor of Otology, Rhinology and Laryngology, Rush Medical College of the University of Chicago; Otolaryngologist of the Presbyterian Hospital, and Elmer W. Hagens, M.D., Instructor in Otology, Rhinology and Laryngology and Friedberg Fellow in Otolaryngology, Rush Medical College of the University of Chicago, with the collaboration of George E. Shambaugh, Jr., M.D., Clinical Assistant in Otolaryngology, Rush Medical College of the University of Chicago; Resident in Otolaryngology, Presbyterian Church. 632 pages. Chicago: The Year Book Publishers, 1933. $2.50.

While many operative procedures are abstracted that are of value only to the specialist in eye, ear, nose and throat, there are also many that will interest the general practitioner, who sees most of these cases first. During the past year much interest has been aroused in the injuries due to eye lash dyes. The symptoms of these are described by W. Bob. A number of ophthalmologists are reporting the use of pantocain in operative procedures. G. R. Callender reports on the pathological types of eye tumors and J. S. Freidenwald presents the statistics of Major P. E. McNabb showing the location of these tumors. According to D. Guthrie, it is the practice to operate upon all cases of mastoiditis early. He wonders if we are not too hasty and gives reasons. A number of other surgeons take the opposite view. The Committee of Otology of the Royal Society of Medicine renders an interesting report on the use of hearing tests. The editors' note on sinus headache calls attention to the tendency to blame infected sinuses for all headaches. W. W. Duke gives a comprehensive discussion of allergy with many valuable, practical suggestions. The book would be improved by more editorial comments in the section on eye diseases. Those in the section on ear, nose and throat are keen and helpful.

America Self-Contained. By Samuel Crowther. 340 pages. Garden City, New York: Doubleday, Doran & Co., Inc., 1933.

Samuel Crowther establishes the premise that the United States has no friends among the nations of the earth as the result of its meddling in foreign affairs and as the results of its crusades. The first of these crusades is described as the entrance into the World War and the sending of our manpower to Europe; the second is cal'ed the "Bankers' Crusade," due to the orgy of money lending that followed the War.

Our resources are enumerated and the vast strides of our chemical industry, both of which now free us from the dependent role that was thrust upon us before the advent of the World War. The author feels that if we were selling the full volume of goods to our own markets that they are capable of absorbing, we should have no surplus to worry about. The only way that this can be done is to raise tariffs high enough to keep out the foreign goods. Numerous examples are given of the tactics displayed by competitors to eliminate industries in this country. The book is written in popular style and contains a mass of logically presented data.

Bentley and Driver's Text-Book of Pharmaceutical Chemistry. Revised by John Edmund Driver, Ph.D., M.Sc., A.I.C., Lecturer on Chemistry in the University College of Nottingham. Second Edition. 538 pages. New York: Oxford University Press, 1933. Cloth, $7.00.

This book is designed for students who are appearing before the pharmaceutical examining agencies of the British Empire. The British Pharmacopeia is followed exclusively. The volume has been brought up to date.

Southern Medical News

ALABAMA

The Southern Interurban Gynecological and Obstetrical Society held a one-day session in Birmingham, February 17. The morning program consisted of a dry clinic conducted by Dr. Lee F. Turlington, Birmingham, with three gynecological and three obstetrical cases as the material. The afternoon program consisted entirely of scientific papers. Guest speakers presenting papers were Dr. E. D. Plass, Professor of Obstetrics and Gynecology at Iowa State University, Iowa; and Dr. George P. Muller, Professor of Clinical Surgery at the University of Pennsylvania. At a round table luncheon session in the middle of the day the Society elected the following officers for the coming year: Dr. J. R. Garber, Birmingham, President; Dr. W. R. Cooke, Galveston, Texas, Vice-President; and Dr. James L. Seibold, Birmingham, Secretary and Treasurer. Dr. W. T. Pride, Memphis, Tennessee, is the retiring President.

Dr. Gene H. Kistler, University, Associate Professor of Physiology and Pharmacology at the University of Alabama School of Medicine, is the recipient of the Joseph A. Capps prize of $500.00, awarded by the Institute of Medicine of Chicago, the award being made to Dr. Kistler for investigative work conducted by him during the last two years.

Dr. Arthur M. Shelamer, Union Springs, is the newly appointed Health Officer of Colbert County.

Dr. Cline V. Hendrix, Oneonta, formerly Health Officer of Blount County, has resigned to go into private practice.

Dr. Samuel D. Sturkie, Jr., Collinsville, has been made Health Officer of Blount County.

Dr. William A. Stanley, recently acting Health Officer of Blount County, is the newly appointed Health Officer of Bullock County.

Deaths

Dr. Simeon Madison Wilhite, Decatur, aged 72, died December 29 of bronchopneumonia.

Dr. George Coke Williams, Anniston, aged 82, died January 25 of hypertrophy of the prostate and uremia.

Dr. Olin E. Newton, Fayette, aged 52, died December 12.

Dr. Burgess E. Scruggs, Huntsville, aged 76, died January 21 of myocarditis and influenza.

ARKANSAS

The Arkansas State Board of Health, at its meeting in January, elected the following officers for the coming year: Dr. J. G. Gladden, Western Grove, President; Dr. Thomas Wilson, Wynne, Vice-President; and Dr. W. B. Grayson, Little Rock, Secretary.

The Staff of St. Vincent's Infirmary, at a recent meeting, appointed Dr. M. J. Kilbury Chief of Staff and Dr. R. J. Calcote, Secretary, both of Little Rock.

Dr. Ewell I. Thompson, Little Rock, is the newly appointed consulting dermatologist to the Leo N. Levi Memorial Hospital, and the Public Health Service Clinic at Hot Springs National Park.

Dr. K. W. Cosgrove, Little Rock, is the newly elected President of the Kiwanis Club of his city.

Dr. Charles H. Lutterloh, Hot Springs National Park, has become associated with Dr. Euclid M. Smith for practice, with offices in the Medical Arts Building.

Dr. Virgil Payne, formerly of Greenville, Mississippi, has located at Pine Bluff for the practice of medicine.

Continued on page 19

In POLYNEURITIS *of* PREGNANCY

Large Amounts of Vitamine-B Concentrates are advised by

FREE SAMPLES TO PHYSICIANS

STRAUSS and McDONALD, Jr. A. M. A., April 29, 1933

THEY STATE: . . . "1. The polyneuritis of pregnancy is probably a dietary deficiency disorder similar to beriberi.

2. Rational therapy should aim to supply the deficiency, which may be especially some portion of the Vitamin B complex; large amounts of concentrates of this substance are advised.

3. In 'pernicious' vomiting of pregnancy prophylactic use of Vitamin B is suggested."

THEY REPORT . . . cases where YEAST VITAMINE (HARRIS) TABLETS were used, "in order to continue a high Vitamin-B_1 intake."

THEY PRESCRIBED . . "twelve *Yeast Vitamine (Harris) Tablets*—daily."

Yeast Vitamine-Harris Tablets contain "a concentrate" of Vitamine-B (F & G) or (B_1 & B_2) made from Brewers' Yeast-Harris, a remarkably pure culture of brewers' yeast, prepared especially for medical use. Brewers' Yeast is the richest known source of Vitamine-B. The tablets are standardized, palatable and keep indefinitely.

Prepared by

THE HARRIS LABORATORIES

TUCKAHOE NEW YORK

Continued from page 376

Dr. Daniel R. Hardeman has located at Little Rock for the practice of surgery and diagnosis, with offices in the Donaghey Building.

Dr. W. M. Majors, Paragould, was honored by Adam Jackson Post No. 17, the American Legion, recently when they presented him with a car heater in recognition of his services to the Post.

The Cleveland County Medical Society has elected the following officers for 1934: Dr. A. J. Hamilton, President; Dr. T. L. Adams, Vice-President; and Dr. W. G. Hancock, Secretary-Treasurer; all of Rison.

The Conway-Pope-Yell County Medical Society has elected the following officers for 1934: Dr. L. M. Smith, Russellville, President; Dr. E. L. Matthews, Morrilton, Vice-President; and Dr. Robert Hood, Russellville, Secretary-Treasurer.

The Franklin County Medical Society has elected the following officers for 1934: Dr. W. H. Gibbons, President; Dr. W. C. Porter, Vice-President; and Dr. Thomas Douglas, Secretary-Treasurer; all of Ozark.

The Johnson County Medical Society has elected the following officers for 1934: Dr. J. S. Kolb, President; Dr. J. M. Kolb, Vice-President; and Dr. Earle H. Hunt, Secretary-Treasurer; all of Clarksville.

The Lonoke County Medical Society has elected the following officers for 1934: Dr. J. R. Wells, Scott, President; and Dr. O. D. Ward, England, Secretary.

The Mississippi County Medical Society has elected the following officers for 1934: Dr. J. L. Tidwell, Dell, President; Dr. J. J. Polk, Kesier, Vice-President; and Dr. F. D. Smith, Blytheville, Secretary-Treasurer.

The Tri-County Medical Society has elected the following officers for 1934: Dr. Leslie A. Purifoy, El Dorado, President; Dr. W. P. Cooksey, Magnolia, Vice-President; and Dr. D. E. White, El Dorado, Secretary.

DEATHS

Dr. Walter Oling Parrish, Rector, aged 58, died December 30.

Dr. John H. Harkness, Belleville, aged 85, died December 21 of carcinoma of the stomach.

Dr. Clifton E. Whitney, Little Rock, aged 67, died January 16 of heart disease.

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ST. LOUIS, MISSOURI

Dr. Thomas Morgan Mitchell, Fort Smith, aged 76, died January 23.

Dr. Frank B. Kirby, Harrison, aged 56, died January 20 of a heart attack.

Dr. C. F. Nelms, Laneburg, aged 62, died December 25.

DISTRICT OF COLUMBIA

The Georgetown University School of Medicine, Washington, announces the appointment of Dr. William P. Herbst to the Medical Faculty, as Professor of Clinical Urology; and also Chief of the Georgetown Urological Service of the Gallinger Municipal Hospital.

DEATHS

Dr. Robert Wilson Shufeldt, Washington, Major, U. S. Army, retired, aged 83, died January 21 of arteriosclerosis.

Dr. Robert Young Sullivan, Washington, aged 52, died January 16.

FLORIDA

The Duvall County Hospital, Jacksonville, has elected the following officers of its staff for 1934: Dr. Shaler Richardson, President; Dr. W. M. Shaw, Vice-President; and Dr. Louie Limbaugh, Secretary; all of Jacksonville.

Dr. Walter A. Weed has moved from Lakeland to Orlando to practice, with offices in the Exchange Building.

The Lee County Medical Society has been announced as the first on the honor roll for paying 1934 dues 100 per cent.

Dr. Jean Jones Perdue has located at Miami Beach for the practice of internal medicine, and has become associated with Dr. C. Frederic Roche and Dr. Harold A. Ryan, with offices at 1213 Lincoln Road.

The Alachua County Medical Society has elected the following officers for 1934: Dr. J. L. Summerlin, Gainesville, President; Dr. C. D. Whitaker, Raiford, First Vice-President; Dr. J. M. Willis, Williston, Second Vice-President; and Dr. Harry M. Merchant, Gainesville, Secretary-Treasurer.

The Brevard County Medical Society has elected the following officers for 1934: Dr. Thomas C. Kenaston, Cocoa, President; Dr. J. D. Chunn, St. Cloud, Vice-President; and Dr. I. K. Hicks, Melbourne, Secretary-Treasurer.

The Broward County Medical Society has elected the following officers for 1934: Dr. Bruce F. Butler, Hollywood, President; Dr. Anna A. Darrow, Ft. Lauderdale, Vice-President; and Dr. O. C. Brown, Ft. Lauderdale, Secretary-Treasurer.

The Columbia County Medical Society has elected the following officers for 1934: Dr. L. M. Anderson, President; Dr. R. B. Harkness, Vice-President; and Dr. T. H. Bates, Secretary-Treasurer; all of Lake City.

The Marion County Medical Society has elected the following officers for 1934: Dr. J. L. Chalker, Ocala, President; Dr. A. G. Brown, Dunnellon, Vice-President; and Dr. R. C. Cumming, Ocala, Secretary-Treasurer.

The Orange County Medical Society has elected the following officers for 1934: Dr. J. R. Chappell, Orlando, President; Dr. T. M. Rivers, Kissimmee, Vice-President; Dr. J. A. Pines, Orlando, Secretary; and Dr. H. A. Day, Orlando, treasurer.

The Sarasota County Medical Society has elected the following officers for 1934: Dr. J. C. Patterson, President; Dr. A. O. Morton, Vice-President; and Dr. J. E. Harris, Secretary-Treasurer; all of Sarasota.

The St. John County Medical Society has elected the following officers for 1934: Dr. V. A. Lockwood, President; Dr. G. Walter Potter, Vice-President; Dr. Reddin Britt, Secretary; and Dr. Charles Grace, Treasurer; all of St. Augustine.

The Sumter County Medical Society has elected the following officers for 1934: Dr. A. B. Albritton, Wildwood, President; and Dr. W. E. Mitchell, Coleman, Secretary-Treasurer.

The Taylor County Medical Society has elected the following officers for 1934: Dr. W. J. Baker, Foley, President; and Dr. C. A. O'Quinn, Perry, Secretary-Treasurer.

Dr. Frank Merrill Wattles and Miss Charlotte Olivia Grimm, both of Palatka, were married in January.

DEATHS

Dr. Sampson Stratford Sargent, Tampa, aged 85, died January 8 of cerebral softening and uremia.

Dr. John Elliott Boyd, Jacksonville, aged 64, died January 26 of acute encephalitis.

Dr. Clyde Clement Bohannon, Daytona Beach, aged 58, died January 29 of myocarditis.

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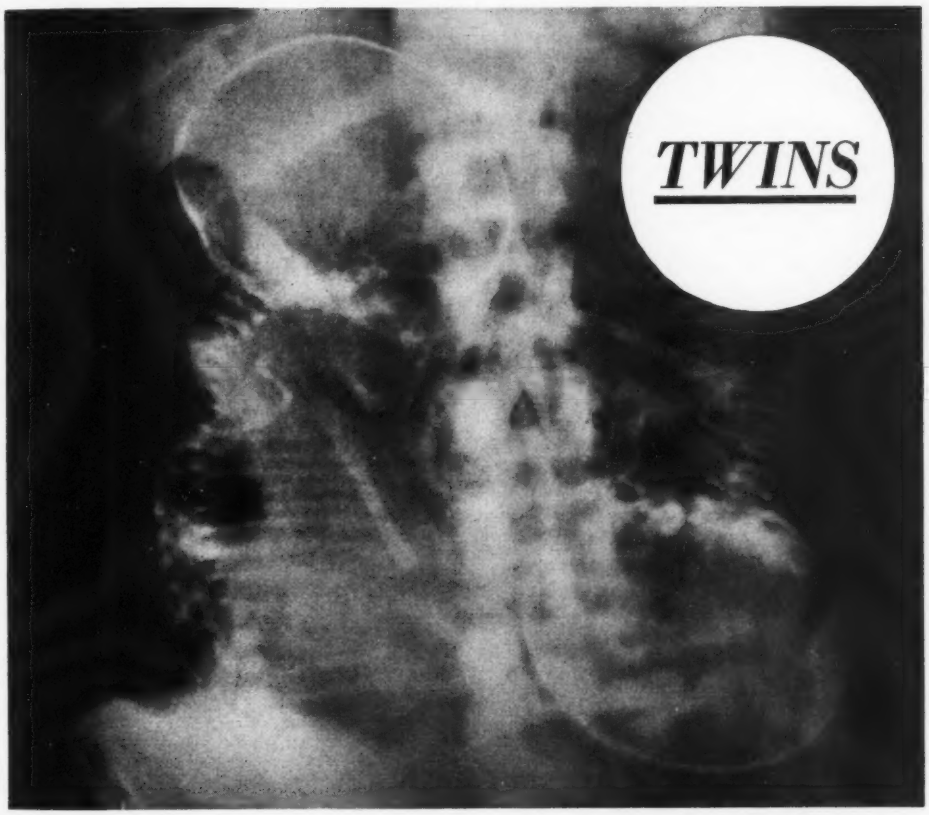

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Continued from page 20

GEORGIA

The Emory University School of Medicine recently was presented with a portrait of the late Dr. Edward Bates Block.

Dr. C. B. Upshaw is the newly-elected President of the Piedmont Hospital Staff; Dr. Hugh M. Lokey was elected Vice-President; and Dr. William H. Trimble reelected Secretary; all of Atlanta.

The following Atlanta physicians have been selected by the Atlanta Chamber of Commerce to serve during 1934 on its Health Committee: Dr. T. F. Abercrombie, Dr. Marion T. Benson, Dr. W. Troy Bivings, Dr. Allen H. Bunce, Dr. F. Phinizy Calhoun, Dr. T. C. Davidson, Dr. W. S. Elkin, Dr. Howard Hailey, Dr. J. P. Kennedy, and Dr. Marion C. Pruitt.

Dr. George A. Traylor, Augusta, has been elected to succeed Dr. H. W. Shaw, deceased, as a member of the Richmond County Board of Health.

Dr. and Mrs. C. A. Witmer, Waycross, were hosts recently at a dinner for members of the Ware County Medical Society.

Dr. J. R. Dykes, Cairo, was recently reelected Health Commissioner of Grady County.

Dr. J. H. Jackson, Barnesville, is the newly elected Commissioner of Health of Lamar County.

Dr. H. F. Bent, Midville, was recently reelected Mayor of Midville.

Dr. L. P. Longino, Milledgeville, has been elected Medical Director of the Milledgeville State Hospital, and Dr. J. I. Garrard, Milledgeville, elected Superintendent.

Dr. T. I. Willingham, Atlanta, recently held a preschool clinic for young children in Hapeville.

Dr. Lawson Thornton and Dr. Calvin Sandison, Atlanta, have become associated in the practice of orthopedic and plastic surgery, with offices in the Doctors Building.

Dr. William A. Palmour, Gainesville, is the newly elected City Commissioner.

The Ware County Hospital Staff, Waycross, has elected the following officers for 1934: Dr. C. A. Witmer, President; Dr. Kenneth McCullough, Vice-President; and Dr. W. L. Pomeroy, Secretary.

The Fulton County Medical Society recently sponsored a series of lectures given by Dr. Richard Shatzki of Boston.

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The Gordon County Medical Society has elected the following officers for 1934: Dr. W. R. Barnett, President; and Dr. Z. V. Johnston, Secretary; both of Calhoun.

The Habersham County Medical Society has elected the following officers for 1934: Dr. R. B. Lamb, Demorest, President; Dr. F. C. Whelchel, Alto, Vice-President; and Dr. O. N. Harden, Cornelia, Secretary-Treasurer.

The Hancock County Medical Society has elected the following officers for 1934: Dr. Horace Darden, President; and Dr. H. L. Earl, Secretary-Treasurer; both of Sparta.

The Screven County Medical Society has elected the following officers for 1934: Dr. John C. Cail, Sylvania, President; Dr. W. H. Doster, Rocky Ford, Vice President; and Dr. W. H. Bennett, Sylvania, Secretary-Treasurer.

The Sumter County Medical Society has elected the following officers for 1934: Dr. J. T. Stukes, President; Dr. A. C. Primrose, Vice-President; and Dr. R. C. Pendergrass, Secretary-Treasurer; all of Americus.

The Whitfield County Medical Society has selected the following officers for 1934: Dr. G. L. Broaddrick, President; Dr. D. L. Wood, Vice-President; and Dr. H. J. Ault, Secretary-Treasurer; all of Dalton.

Dr. Charlie Newton Wasden and Miss Eugenia Coleman, both of Macon, were married recently.

Dr. Wilborn E. Upchurch, Atlanta, and Miss Katherine Crowell were married recently.

Dr. Sidney Terrell Parkerson, Unadilla, and Miss Mary Raby were married in January.

DEATHS

Dr. William J. Greene, Ringgold, aged 63, died January 8 of nephritis and renal calculi.

Dr. Henry Daniel Cunyers, Rome, aged 85, died December 31 of chronic nephritis.

Dr. William B. Floyd, Rome, aged 65, died January 18 of heart disease.

Dr. Albert LeRoy Crittenden, Shellman, aged 54, died January 25.

Dr. Leonard J. Pharr, Conyers, aged 52, died January 14 in an Atlanta hospital.

Dr. N. Charles Alston, Richland, aged 78, died December 31.

Dr. Robert Stephen Reid, Savannah, aged 62, died suddenly January 4.

Dr. Fred R. Wallace, Cordele, aged 77, died January 13.

KENTUCKY

The Franklin County Medical Society has elected the following officers for 1934: Dr. R. M. Coblin, President; Dr. A. M. Lyon, Vice-President; and Dr. William S. Snyder, Jr., Secretary-Treasurer; all of Frankfort.

The Grant County Medical Society has elected the following officers for 1934: Dr. Harry F. Mann, Crittenden, President; Dr. J. D. George, Corinth, Vice-President; and Dr. C. A. Eckler, Dry Ridge, reelected Secretary-Treasurer.

The Greenup County Medical Society has elected the following officers for 1934: Dr. M. W. Meadows, Russell, President; Dr. J. A. Franz, Fullerton, Vice-President; and Dr. Carl M. Gambill, Greenup, Secretary-Treasurer.

The Harlan County Medical Society has elected the following officers for 1934: Dr. M. L. Gunn, Harlan, President; Dr. P. W. Adkins, Insull, Vice-President; and Dr. Clark Bailey, Harlan, Secretary-Treasurer.

The Harrison County Medical Society has elected the following officers for 1934: Dr. M. McDowell, Cynthiana, President; Dr. H. Todd Smiser, Lexington, Vice-President; and Dr. W. B. Moore, Cynthiana, Secretary-Treasurer.

The Henderson County Medical Society has elected the following officers for 1934: Dr. W. V. Neel, Henderson, President; Dr. E. K. Galloway, Vice-President; and Dr. W. L. O'Nan, Secretary-Treasurer.

The Letcher County Medical Society has elected the following officers for 1934: Dr. T. M. Radcliffe, Kona, President; Dr. J. E. Crawford, Whitesburg, Vice-President; and Dr. R. Dow Collins, Whitesburg, Secretary-Treasurer.

DEATHS

Dr. James Benton Messer, Bluestone, aged 73, died January 13 of heart disease.

Dr. Isaiah S. Wesley, Liberty, aged 67, died suddenly February 1 of heart disease.

Dr. Charles Edward Clayton, Birmingham, aged 74, died January 21 of pneumonia.

Continued on page 24

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Continued from page 22

Dr. Euclid D. Covington, Murray, aged 50, died January 14 of heart disease.

Dr. Jefferson Lee Atkinson, Campbellsville, aged 70, died January 29 of heart disease.

LOUISIANA

The Louisiana State Medical Association announces its annual meeting for April 10-12 in Shreveport.

The New Orleans Academy of Science held its annual meeting March 23 and 24.

Dr. C. C. DeGravelles has moved from Morgan City to New Iberia and opened offices in the State National Bank Building.

Dr. J. R. Turner, formerly of Homer, has moved to Amherst, Texas, for general practice.

Deaths

Dr. Nemours Caire, Westwego, aged 52, died January 8 of heart disease.

Dr. William Lemos Stone, Homer, aged 64, died December 27 of coronary thrombosis.

MARYLAND

The William Sydney Thayer and Susan Read Thayer Lecture in Clinical Medicine was delivered in March at the Hurd Memorial Hall of Johns Hopkins Hospital by Dr. James B. Murphy of the Rockefeller Institute for Medical Research.

Dr. Lewellys F. Barker, Baltimore, recently conducted a medical clinic at the University of Maryland, this being the first of a series of clinics under the auspices of the Division of Medical Extension.

Dr. Charles C. Hedges, Baltimore, formerly Assistant Superintendent of Johns Hopkins Hospital, was recently appointed Superintendent of the Roosevelt Hospital in New York City.

Dr. Charles H. Halliday, Baltimore, and Miss Frances Allen Steger were married recently.

Dr. George Edward Urban, Baltimore, and Miss Ellen Josephine Stafford were married recently.

Dr. Francis Wilcox Gluck, Baltimore, and Miss Jean Harvey Anderson were married in February.

Deaths

Dr. Homer Berkley Walker, Cumberland, aged 43, died December 26 of pneumonia.

Dr. George Henry Heald, Takoma Park, aged 72, died January 22 of cardio-renal vascular disease.

Dr. Wilmer Brinton, Baltimore, aged 79, died February 12.

MISSISSIPPI

The Mississippi State Medical Association will hold its annual session in Natchez, May 8, 9, and 10.

The Staff of the King's Daughters' Hospital, Greenville, has elected the following officers for 1934: Dr. J. F. Lucas, President; Dr. O. H. Beck, Vice-President; Dr. J. W. Shackelford, Secretary; Dr. P. G. Gamble, Chairman of Section on Surgery; Dr. F. M. Acree, Chairman of Section on Medicine; and Dr. J. C. Pegues, Chairman of Section on Specialties; all of Greenville.

The meeting of the Mississippi State Hospital Association on May 7 this year will be a joint session with the State Hospital Associations of Arkansas, Louisiana and Tennessee, upon special invitation of the Mississippi Association.

The Staff of the Natchez Sanatorium has elected the following officers for 1934: Dr. J. W. D. Dicks, President; Dr. R. D. Sessions, Vice-President; and Dr. W. K. Stowers, Secretary; all of Natchez.

The Staff of the Vicksburg Hospital has elected the following officers for 1934: Dr. Thomas P. Sparks, Jr., Chairman; Dr. W. Pierre Robert, Vice-Chairman; and Dr. Willard H. Parsons, Secretary.

Dr. H. B. Goodman, formerly of Cary, has accepted the position of House Physician at the Vicksburg Sanitarium.

Dr. Virgil Payne, formerly of Greenville, has moved to Pine Bluff, Arkansas.

Dr. Lee Rhodes Reid, Rockport, is taking several months postgraduate work.

The Clarksdale and Six Counties Medical Society and the Delta Medical Society at a recent meeting of representative committees approved a plan for the consolidation of the two societies.

The Adams County Medical Society has elected the following officers for 1934: Dr. E. E. Benoist, Natchez, President; Dr. H. A.

Continued on page 26

"The statement is frequently made that no two babies can be fed in the same manner and that the formula must be individualized in each case. This may be true when certain types of formulas are used, but it is not true in the case of formulas which meet the fundamental requirements. In this connection one should not lose sight of the fact that ***human milk,** which is admittedly the best food for the normal infant, **does not vary appreciably in composition throughout the first year,** the only changes in the feeding of the breast-fed infant being in the total amounts taken and the additional foods which are added to the diet."

Williams McKim Marriott, Infant Nutrition, 151, (1930).

•

"The natural food of the infant is ***human milk** characterized by the fact that its quality **changes very little,** the infant's growth being dependent on the increase in the amount of milk secreted."

Julius H. Hess, Feeding and the Nutritional Disorders in Infancy and Childhood, 7, (1930).

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CLEVELAND, OHIO

Continued from page 24

Whittington, Vice-President; and Dr. W. K. Stowers, Natchez, Secretary-Treasurer.

The Grenada County Medical Society has elected the following officers for 1934: Dr. J. James, Ackerman, President; and Dr. P. B. Brumby, Lexington, Secretary and Treasurer.

DEATHS

Dr. Rushton Clark Molloy, Columbus, aged 64, died January 7 of pernicious anemia.

MISSOURI

The Kansas City Southwest Clinical Society sponsored a medico-military symposium which was conducted in March at the General Hospital, Kansas City.

Dr. Willard Bartlett, Sr., St. Louis, recently made an address before the Medical Association of the Isthmian Canal Zone, as the guest of the Herrick Clinic.

Dr. Archer O'Reilly, St. Louis, recently delivered one of a series of lectures sponsored by the American Association of Hospital Social Workers at Washington University School of Medicine, St. Louis.

The Dallas-Hickory-Polk County Medical Society has elected the following officers for 1934: Dr. R. E. Harrell, Urbana, President; Dr. D. E. Hammontree, Bolivar, VicePresident; and Dr. J. L. Johnston, Wheatland, Secretary and Treasurer.

The Dunklin County Medical Society has elected the following officers for 1934: Dr. E. G. Cope, Hornersville, President; Dr. Wheeler Davis, Kennett, Vice-President; and Dr. T. J. Rigdon, Kennett, Secretary-Treasurer.

The Grundy County Medical Society has elected the following officers for 1934: Dr. U. C. Weston, Galt, President; Dr. Bertha Sheetz, Trenton, Vice-President; and Dr. E. A. Duffy, Trenton, Secretary-Treasurer.

The Lawrence-Stone County Medical Society has elected the following officers for 1934: Dr. J. W. Smith, Aurora, President; Dr. L. M. Lyons, Pierce City, Vice-President; and Dr. V. T. Bickel, Aurora, Secretary-Treasurer.

The South Central Counties Medical Society has elected the following officers for 1934: Dr. J. C. B. Davis, Willow Springs, President; and Dr. A. C. Ames, Mountain Grove, Secretary and Treasurer.

Dr. Jasper Newton Wakeman and Miss Anne Peightel, both of Springfield, were married in February.

DEATHS

Dr. Robert A. Thornton, Joplin, aged 66, died December 11.

Dr. Martin Collins Woodruff, St. Louis, aged 67, died January 12.

Dr. Omer Joseph Ohrel, St. Louis, aged 27, died January 3 of septicemia.

Dr. Otto Leonard Wolter, St. Louis, aged 58, died January 22 of heart disease.

Dr. William E. H. Bondurant, Memphis, aged 79, died January 20 of cerebral hemorrhage.

Dr. Godfrey O. Cuppaidge, Moberly, aged 74, died January 1.

NORTH CAROLINA

Dr. Amzi J. Ellington, Burlington, is the newly elected President for 1934 of the Alamance County Medical Society.

Dr. William deB. MacNider, Chapel Hill, Kenan Research Professor of Pharmacology at the University of North Carolina, was elected President of the American Society for Pharmacology and Experimental Therapeutics at the recent annual meeting of the Society.

Dr. William P. Richardson, formerly Health Officer of Richmond County, has resigned this office to become Assistant Director of the State Laboratory of Hygiene, Raleigh.

Dr. James Grady Faulk, Pembroke, and Miss Sallie Jane Williams were married recently.

DEATHS

Dr. Thomas Stamps, Lumber Bridge, aged 85, died January 24 of pneumonia.

Dr. Benjamin Franklin Cox, Palmersville, aged 83, died January 4 of heart disease.

Dr. Malcolm McInnis Tatum, Mount Olive, aged 86, died December 8 of senility.

Dr. E. Mitchell Summerell, China Grove, aged 76, died January 29 of heart disease.

Dr. Ernest LaFayette English, West Asheville, aged 47, died January 11.

Dr. Charles Richard Reaves, Greensboro, aged 49, died February 6 of pneumonia.

Dr. R. G. Gross, Harmony, aged 37, died February 1.

Dr. Elisha Mitchell Summerell, China Grove, aged 75, died in January.

Dr. Robert Milton Fields, Goldston, aged 64, died January 2 of erysipelas.

OKLAHOMA

Dr. C. M. Pearce, McAlester, has resigned as Superintendent of Health of Pittsburg County, and, after studying in eastern clinics for some weeks, will open offices in McAlester for general practice.

Dr. J. S. Rollins, Prague, recently opened the Rollins Hospital, where he has associated with him Dr. Frank H. Norwood and Dr. Ned Burleson.

Dr. Will C. Wait, McAlester, is the newly elected President of the Staff of Albert Pike Hospital; Dr. J. E. Davis was elected Vice-President; and Dr. J. A. Munn reelected Secretary.

Dr. Charles E. White, Muskogee, has been appointed to succeed Dr. E. H. Coachman, resigned, as County Health Officer.

Dr. D. O. Smith, Tulsa, is the newly elected President of the St. John's Hospital Staff; Dr. F. L. Flack was elected Vice-President; and Dr. J. E. McDonald reelected Secretary-Treasurer.

DEATHS

Dr. Emmett Johnson, Kinta, aged 67, died January 1 of cerebral hemorrhage.

Dr. George W. Goss, Pawhuska, aged 64, died January 10.

SOUTH CAROLINA

Dr. E. H. Thomason, formerly of Honea Path, has moved to State Park and taken up his duties as Resident Physician of the South Carolina Sanatorium.

Dr. Carlos Izlar Green and Miss Kittie E. Albergotti, both of Orangeburg, were married in January.

Dr. Edward Gordon Able, Newberry, and Miss Mary Elizabeth Dowling were married recently.

Continued on page 28

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"Certain definite food, caloric, fluid and vitamin requirements must be met to insure good digestion, normal weight gain, and growth." (Donnelly, J. D., Penn. Med. Jour., Vol. XXXVI, No. 8, May, 1933).

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Continued from page 26

Dr. J. Howard Stokes, McBee, and Miss Helen Rhoad were married recently.

Dr. William A. Hart, Columbia, and Miss Elizabeth Trice were married in January.

DEATHS

Dr. Medicus Emmett Ellis, Hampton, aged 44, died January 31.

TENNESSEE

The Tennessee State Medical Society will hold its one hundred and first annual session in Chattanooga April 10-12.

Dr. Thomas D. Moore, Memphis, has moved into new offices in the Physicians and Surgeons Building.

The Vanderbilt Medical Library has secured the George H. Weaver Collection of books and periodicals and other items of historic interest, which is of value particularly from a standpoint of medical history in this country.

The Haywood County Medical Society has elected the following officers for 1934: Dr. R. T. Keeton, Brownsville, President; Dr. Glenn T. Scott, Brownsville, Vice-President; and Dr. Roy M. Lanier, Secretary-Treasurer.

The Overton, Putnam, White Counties Medical Society has elected the following officers for 1934: Dr. W. C. Officer, Monterey, President; Dr. H. T. Taylor, Cookeville, Vice-President; and Dr. Alex Shipley, Cookeville, Secretary-Treasurer.

The Williamson County Medical Society has elected the following officers for 1934: Dr. H. C. Stewart, President; Dr. Dan German, Jr., Franklin, Vice-President; and Dr. K. S. Howlett, Franklin, Secretary-Treasurer.

Dr. Richard A. Street, Jr., Memphis, and Miss Catherine Noble were married recently.

DEATHS

Dr. George Whitefield Meux, Stanton, aged 51, died January 24 of heart disease.

Dr. William Thomas Watson, Lexington, aged 81, died January 20 of pneumonia.

Dr. Benjamin Franklin Young, Knoxville, aged 82, died December 24 of senility.

Dr. Samuel Marshall Utley, Nashville, aged 65, died January 25 of heart disease.

Dr. George D. Butler, Pulaski, aged 77, died January 16 of cerebral hemorrhage.

Dr. James Alexander Albright, Somerville, aged 73, died February 2 or uremia.

Dr. Emma M. Higginson, Nashville, aged 66, died January 25.

Dr. Aaron E. Armstrong, Knoxville, aged 80, died February 11 from injury received in a fall.

Dr. William Hughes Cole, Minor Hill, aged 54, died February 6 of influenza and pneumonia.

TEXAS

The Angelina County Medical Society has elected the following officers for 1934: Dr. J. W. Hawkins, President; Dr. T. A. Taylor, Vice-President; and Dr. A. E. Sweatland, reelected Secretary-Treasurer; all of Lufkin.

The Caldwell County Medical Society has elected the following officers for 1934: Dr. J. Turner O'Banion, Lockhart, President; Dr. F. C. Luckett, Fentress, Vice-President; and Dr. H. B. Henry, Luling, Secretary-Treasurer.

The Cass-Marion Counties Medical Society has elected the following officers for 1934: Dr. C. E. Davis, Linden, President; Dr. Felix Peebles, Jefferson, Vice-President; and Dr. Joe D. Nichols, Atlanta, Secretary.

The Childress-Collingsworth-Donley-Hall Counties Medical Society has elected the following officers for 1934: Dr. Clifton E. High, Wellington, President; Dr. R. E. Clark, Memphis, Vice-President for Hall County; Dr. J. L. Bubblis, Kirkland, Vice-

Continued on page 30

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Continued from page 28

President for Childress County; Dr. E. W. Jones, Wellington, Vice-President for Collingsworth County; Dr. Guy Stricklin, Clarendon, Vice-President for Donley County; and Dr. O. R. Goodall, Memphis, reelected Secretary-Treasurer.

The Dallas County Medical Society has elected the following officers for 1934: Dr. F. H. Newton, President; Dr. Homer Donald, Vice-President; and Dr. W. W. Fowler, reelected Secretary-Treasurer; all of Dallas.

The DeWitt County Medical Society has elected the following officers for 1934: Dr. John W. Burns, Cuero, President; Dr. Harry H. Brown, Jr., Yoakum, Vice-President; and Dr. Herman C. Eckhardt, Yorktown, reelected Secretary-Treasurer.

The Gonzales County Medical Society has elected the following officers for 1934: Dr. A. B. Parr, President; Dr. George Holmes, Vice-President; and Dr. L. J. Stahl, Secretary-Treasurer; all of Gonzales.

The Guadalupe County Medical Society has elected the following officers for 1934: Dr. Hugh Davis, President; Dr. C. Williamson, Vice-President; and Dr. Allen Heinen, Secretary-Treasurer; all of Seguin.

The Hidalgo County Medical Society has elected the following officers for 1934: Dr. Mouldin Smith, Mission, President; Dr. J. P. Lockhart, Pharr, Vice-President; and Dr. Marion R. Lawler, Mercedes, Secretary-Treasurer.

The Lamar County Medical Society has elected the following officers for 1934. Dr. W. W. Fitzpatrick, President; Dr. T. E. Hunt, Vice-President; and Dr. L. B. Stephens, reelected Secretary-Treasurer; all of Paris.

The Liberty-Chambers Counties Medical Society has elected the following officers for 1934: Dr. Jack Bevil, Hull, President; Dr. George Fahring, Anahuac, Vice-President; and Dr. E. J. Tucker, Liberty, Secretary-Treasurer.

The Lubbock County Medical Society has elected the following officers for 1934: Dr. J. H. Smith, President; Dr. J. W. Rollo, Vice-President; and Dr. R. T. Canon, Secretary-Treasurer; all of Lubbock.

The Parker County Medical Society has elected the following officers for 1934: Dr. P. L. Allen, Weatherford, President; Dr. N. E. Dick, Millsap, Vice-President; and Dr. Alexander S. Garrett, Weatherford, reelected Secretary-Treasurer.

The Scurry Seven Counties Medical Society has elected the following officers for 1934: Dr. W. R. Johnson, Snyder, President; Dr. D. C. Wylie, Aspermont, Vice-President; and Dr. H. E. Rosser, Snyder, Secretary-Treasurer.

The Titus County Medical Society has elected the following officers for 1934: Dr. A. A. Smith, Talco, President; Dr. T. S. Grissom, Mt. Pleasant, Vice-President; and Dr. John M. Ellis, Mt. Pleasant, reelected Secretary-Treasurer.

The Tom Green Eight County Medical Society, embracing the Counties of Tom Green, Coke, Crockett, Concho, Irion, Sterling, Sutton and Schleicher, has recently been formed to take the place of the Tom Green Medical Society, and officers originally elected by the Tom Green Medical Society will serve for 1934 as officers of the newly formed society as follows: Dr. W. B. Everett, Sterling City, President; Dr. L. O. Woodward, San Angelo, Vice-President; Dr. W. D. Anderson, Sanatorium, Secretary; and Dr. H. R. Wardlaw, San Angelo, Treasurer.

The Twelfth District (Central Texas) Medical Society has elected the following officers for 1934: Dr. N. D. Buie, President; and Dr. Howard O. Smith, reelected Secretary; both of Marlin.

The Victoria-Calhoun Counties Medical Society has elected the following officers for 1934: Dr. J. R. Story, President; Dr. J. V. Hopkins, Vice-President; and Dr. Heaton Smith, reelected Secretary-Treasurer; all of Victoria.

The Washington County Medical Society has elected the following officers for 1934: Dr. O. F. Schoenvogel, President; Dr. H. A. Holle, Vice-President; and Dr. T. O. Woolley, reelected Secretary-Treasurer; all of Brenham.

The Wilbarger County Medical Society has elected the following officers for 1934: Dr. A. C. Rogers, President; Dr. M. J. Moore, Vice-President; and Dr. H. L. Lindley, Secretary; all of Vernon.

The El Paso City-County Hospital Board has elected the following officers for 1934: Dr. H. H. Varner, Chairman; Dr. Frank Goodwin, Vice-Chairman; and Dr. A. W. Multhauf, Secretary; all of El Paso.

Dr. J. R. Turner, formerly of Homer, Louisiana, has moved to Amherst to do general practice.

Dr. Joe Dudgeon Walker, Houston, and Miss Martha Alice Nelms were married recently.

The West Texas Baptist Sanitarium has elected the following officers for 1934: Dr. R. P. Glenn, Chairman; Dr. C. L. Prichard, Vice-Chairman; and Dr. George A. Gray, Secretary; all of Abilene.

Continued on page 32

An Endocrine Prescription in Dysmenorrhea and Amenorrhea

You can write an endocrine prescription in one word—a proper combination of the endocrine principles which are now known to initiate and control the menstrual process. Your prescription will have the advantage of being filled with fresh potent endocrine constituents. The formula is in accord with the most recent research on the endocrine glands concerned in regulating menstruation.

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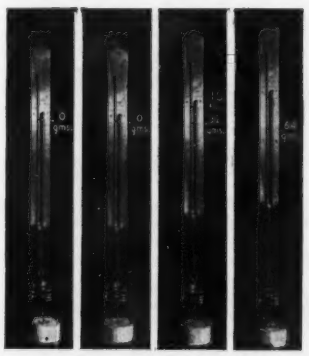
ITS · EFFECT · UPON · THE · ASSIMILATION · OF SALTS



BREAST MILK SIMILAC POWDERED MILK COW'S MILK

C—Cow's milk S—Similac
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"THE mineral salts play a very complicated part in digestion because they are not only absorbed by the intestines but also may be re-excreted into the digestive canal." [1]

"The mineral salts are of even greater importance in infancy than in later life because of the rapid growth of the bony structure . . . The salts are also necessary for cell growth and are important constituents of the blood and digestive juices, facilitating secretion, absorption and excretion." [2]

Some of the important mineral salts are encased within the large tough curds formed from cow's milk, and only those salts that are not encased in the curds are available for metabolism.

The curds formed from SIMILAC are small and flocculent, registering zero on the tensiometer, as shown in illustration, hence the mineral salts of SIMILAC are available for metabolism.

The salts of the cow's milk used in the preparation of SIMILAC are rearranged, particularly with reference to calcium, sodium, and potassium, as well as phosphorus and chlorine. SIMILAC has a salt balance that cannot be obtained in the ordinary milk dilutions or modifications as made in the home or laboratory.

The finer the curd the greater the surface area. The greater the surface area the more exposed are the fats, carbohydrates, proteins and salts to the digestive enzymes. Result . . . a more complete utilization of the food elements.

[1] Morse and Talbot: Diseases of Nutrition and Infant Feeding, pg. 59.

[2] Marriott: Infant Nutrition, pg. 43.

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Continued from page 30

DEATHS

Dr. Bartlett Uttimus Sims, Bryan, aged 55, died January 6 of injuries received in an automobile accident.

Dr. Claude Mattingly, Austin, aged 38, died February 1.

Dr. Peter R. Robinson, Ennis, aged 68, died December 28 of cerebral embolism.

Dr. Hugh Franklin Wagley, Mineral Wells, aged 68, died December 12 of cerebral hemorrhage.

Dr. Henry R. Noark, Houston, aged 69, died December 7 of myocarditis and hypertension.

Dr. Johannes George Arthur Weiss, San Antonio, aged 71, died January 25 of myocarditis.

Dr. Thomas R. Pettway, Austin, aged 83, died December 12 of pneumonia.

VIRGINIA

The Tri-State Medical Association of Virginia and the Carolinas, which met at Charlottesville in February, has elected the following officers for 1934: Dr. Paul V. Anderson, Richmond, President; Dr. H. S. Hedges, Charlottesville, Dr. Clyde M. Gilmore, Greensboro, North Carolina, Dr. Junius H. Taylor, Columbia, South Carolina, Vice-Presidents; and Dr. J. M. Northington, Charlotte, North Carolina, reelected Secretary-Treasurer.

Dr. R. L. Mason, Roanoke, is the newly appointed Assistant Surgeon in Chief Sons of Confederate Veterans, for 1933-1934.

Dr. John R. Gill, formerly with the staff of Central State Hospital, Petersburg, has moved to Mathews where he will do general practice.

The Stuart McGuire Lectures this year will be delivered April 2 and 3 by Dr. Frank Charles Mann, Professor of Experimental Surgery, Mayo Foundation.

Dr. Hugh C. Henry, Petersburg, Superintendent of Central State Hospital, recently received an appointment from the Governor as a member of the Governor's Advisory Board on Mental Hygiene.

Dr. Robert Whitehead has moved from Richmond to Victoria.

The Medical College of Virginia will hold its spring Post-Graduate Clinic on April 2 and 3.

The following Richmond physicians have been elected on the Richmond Tuberculosis Association: Dr. P. D. Lipscomb and Dr. Kinloch Nelson, Vice-Presidents; and Dr. Robert C. Bryan, Dr. E. C. Harper and Dr. S. A. Anderson, Jr., reelected as Directors.

Dr. Euclid Neal has moved from Big Island to Alta Vista.

Dr. Alexander N. Chaffin, formerly of Rural Retreat, has moved to Galax where he will be associated with Dr. Beverly F. Eckles at the Galax Hospital.

The James City-New Kent Medical Society has elected the following officers for the coming year: Dr. J. R. Parker, Providence Forge, President; Dr. J. R. Tucker, Williamsburg, Vice-President; and Dr. L. V. Henderson, Toano, Secretary-Treasurer.

The Princess Anne County Medical Society has elected the following officers for 1934: Dr. Robert W. Woodhouse, President; and Dr. Cora Z. Corpening, reelected Secretary; both of Virginia Beach.

The Smyth County Medical Society has elected the following officers for 1934: Dr. A. B. Graybeal, President; Dr. Carolyn Sherrill, Vice-President; and Dr. E. A. Holmes, Secretary-Treasurer; all of Marion.

Dr. William Lloyd Eastlack and Miss Muriel E. Reynolds, both of South Boston, were married recently.

DEATHS

Dr. Thomas Alsop, Richmond, aged 61, died January 15 of bronchopneumonia.

Dr. Elbert Lee Addington, Coeburn, aged 56, died January 13 of heart disease.

Dr. William W. Wilkins, Eastville, aged 86, died December 16 of senility.

Dr. George Bright Young, Charlottesville, Senior Surgeon, U. S. Public Health Service, aged 73, died February 13 of hemiplegia.

Dr. Harry Wilson Porter, Louisa, aged 59, died suddenly February 20 of apoplexy.

Dr. John Walker Carter Jones, Newport News, aged 55, died February 9.

Dr. Basil Dennis Spalding, Richmond, aged 70, died February 18.

WEST VIRGINIA

The Greenbrier Valley Medical Society has elected the following officers for 1934: Dr. R. E. Baer, White Sulphur Springs, President; Dr. W. E. Myles, White Sulphur Springs, Vice-President; and Dr. A. G. Lanham, Ronceverte, Secretary and Treasurer.

The Hancock County Medical Society has elected the following officers for 1934: Dr. C. A. Shafer, Chester, President; Dr. G. H. Davis, Weirton, Vice-President; and Dr. F. B. Harrington, Weirton, reelected Secretary-Treasurer.

The Harrison County Medical Society has elected the following officers for 1934: Dr. W. T. Gocke, President; Dr. R. J. Nutter, Vice-President; Dr. E. B. Wright, Secretary; and Dr. Creed C. Greer, Treasurer; all of Clarksburg.

The Kanawha Medical Society has elected the following officers for 1934: Dr. John W. Moore, President; Dr. O. H. Bobbitt, Vice-President; and Dr. A. E. Amick, Secretary-Treasurer; all of Charleston.

The Logan County Medical Society has elected the following officers for 1934: Dr. Fred E. Brammer, Dehue, President; Dr. Harold Van Hoose, Whitman, Vice-President; and Dr. C. L. Border, Logan, Secretary-Treasurer.

The Marion County Medical Society has elected the following officers for 1934: Dr. G. R. Miller, Fairview, President; Dr. L. D. Norris, Fairmont, Vice-President; Dr. G. H. Traugh, Fairmont, Secretary; and Dr. C. W. Waddell, Fairmont, Treasurer.

The Mercer County Medical Society has elected the following officers for 1934: Dr. J. I. Markell, Princeton, President; Dr. D. L. Hosmer, Bluefield, Vice-President; Dr. R. R. Stuart, Bluefield, Secretary; and Dr. H. G. Steele, Bluefield, Treasurer.

The Wyoming County Medical Society has elected the following officers for 1934: Dr. D. D. Wilkinson, Wyco, President; Dr. J. O. Robins, Glen Morrison, Vice-President; and Dr. Ward Wylie, Mullens, Secretary and Treasurer.

DEATHS

Dr. David Bigger Best, Wheeling, aged 71, died January 11 of myocarditis.

Dr. Morgan Morgan, Martinsburg, aged 75, died January 2 of chronic myocarditis.

Dr. William Josiah Thomas, Charleston, aged 61, died December 2 of angina pectoris.

Dr. Adrian Hansford Grigg, Beckley, aged 45, died January 6 of pneumonia.

Dr. Rufus Maurice Musick, Delbarton, aged 43, died in December of acute nephritis.

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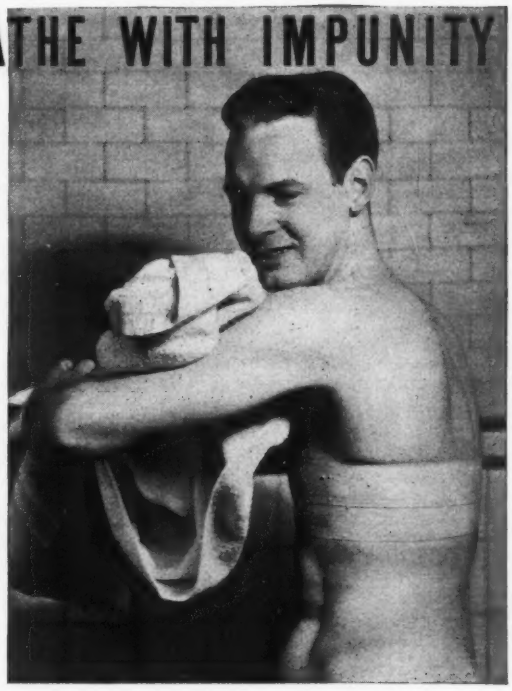

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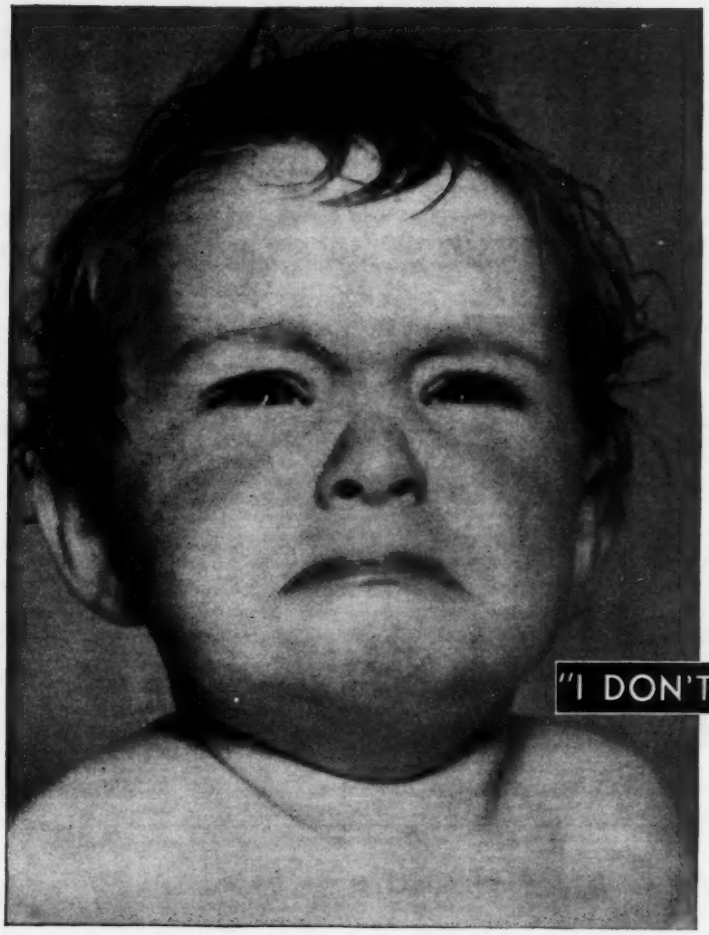

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It takes more severity than many mothers can command to force spinach upon a tearful child. Yet careful menu-planning is needed to make up the 12 mg. of iron required daily. Leichsenring and Flor, as an example, found that children's diets planned to contain 5 and 8.5 mg. iron actually supplied only 3.25 and 6.5 mg., respectively, although the diet was designed to provide a high iron intake and included such foods as raisins, carrots, graham bread, prunes, lettuce, beef, and egg.[1]

PABLUM *tastes good*

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PABLUM is a food that children really like and take willingly. Added to this virtue, it supplies *known* amounts of iron—more than any other food of equal caloric value! This unique pre-cooked cereal contains 566% more iron than fresh spinach with an iron content of 3.6 mg.[2] (The U. S. Dept. of Agriculture reports an even lower average for spinach—2.5 mg.[3]) When included in the child's daily diet from the third month on, Pablum is a valuable prophylactic against nutritional anemia. Besides the hemoglobin-building element, iron, Pablum contains copper and substantial amounts of calcium, phosphorus, and vitamins A, B, E, and G. Abundant, too, in calories, proteins, fat, and carbohydrates.

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for sick as well as normal babies
Dextri-Maltose, Carbohydrate of Choice

In gastrointestinal disorders, "Dextri-maltose has been preferred to the other sugars as apparently less irritating."—*E. Cassie and U. Cox: The examination of the gastric contents in infants, with some considerations as to the value of lactic acid milk in infant feeding, Lancet, 2:322-325, August 14, 1926.*

"As to the kind of extra carbohydrate to be added, whether lactose or maltose, I believe dextri-maltose to be better in general in cases of fat indigestion (infantile atrophy)."—*C. H. Dunn: The Hygienic and Medical Treatment of Children, Southworth Co., Troy, New York, 1917, V. 1, p. 418.*

In the treatment of decomposition: "The period of repair may be shortened by giving suitable additional food; the best, probably, being buttermilk to which carefully regulated proportions of dextrin and maltose preparations or malt soup are added."—*E. Feer: Text-Book of Pediatrics, J. B. Lippincott Co., Phila., 1922, p. 284.*

In infantile atrophy: "The carbohydrate should be increased by gradual addition of dextrimaltose.

"Malt soup or dextrimaltose (Mead's) should be added in teaspoonful or more doses to each feeding until the point of carbohydrate tolerance is reached."—*L. Fischer: Diseases of Infancy and Childhood, F. A. Davis Co., Phila., 1925, V. 1, p. 285.*

In the case of a premature infant: "Dried milk with water was given, which later was changed to whole milk, 14 ounces; water, seven ounces, and dextri-maltose No. 1, one and one-half ounces. Seven feedings of three ounces each every three hours was given. The above feeding was retained. The infant gained eight ounces at the end of the first week."—*L. Fischer: Clinical notes in a series of premature infants, Arch. Pediat. 44:227-231, April, 1927.*

In the treatment of decomposition: "As a rule it is best to start with 2 to 2½ or 3 ounces of albumin milk to the pound weight in 24 hours; the sugar to be added is in the form of a maltose-dextrin mixture. One should never delay too long in adding this."—*C. G. Grulee: Infant Feeding, W. B. Saunders Co., Phila., 1922, p. 265.*

With reference to hypotrophy: "In mild cases, the addition of dextrimaltose instead of cane or milk sugar may be sufficient to obtain a gain in weight."—*C. Herrman: The treatment of nutritional disorders in artificially-fed infants, New York M. J. 114:158-160, August, 1921.*

In athrepsia: "The carbohydrates are usually added in a slowly fermentable form, such as the maltose and dextrin compounds, which are usually started by the addition of four grams per kilogram (1/15 ounce per pound) and increased until eight grams or more per kilogram (¼ ounce per pound) of body weight are added."—*J. H. Hess: Feeding and the Nutritional Disorders in Infancy and Childhood, F. A. Davis Co., Phila., 1928, p. 278.*

Concerning the treatment of marasmus: "When the stools have become smooth and salve-like, carbohydrate, in the form of dextrimaltose, may be gradually added up to the limit of tolerance."—*L. W. Hill: Practical Infant Feeding, W. B. Saunders Co., Phila., 1922, p. 281.*

In the feeding of prematures: "As soon as there is a hesitation in the gain in weight, dextrimaltose No. 1 is substituted for the dextrose, in the same amount in the mixture, with almost invariably a gain in weight."—*F. B. Jacobs: Relation of irradiated food substances and ergosterol versus cod liver oil in childhood nutrition, Pennsylvania M. J. 35:164-167, Dec., 1931.*

"A spasmophilic baby on bottle feeding should receive a limited amount of milk—a pint, or at the most 24 ounces in the 24 hours—to which cereal gruel and some form of sugar is added, preferably one of the malt dextrin preparations; also the early addition of other foods than milk to the baby's diet."—*M. Jampolis: Infantile spasmophilia, Interstate M. J. 25:652, Sept., 1918; abst. Arch. Pediat. 35:691, Nov., 1918.*

In cases of malnutrition and indigestion, "The appetite improves rapidly, and the stools soon become normal in appearance, if the sugars are intelligently prescribed. By this I refer to proper proportions of dextrin and maltose. When there is a tendency to looseness, I have used the preparation known as 'dextri-maltose,' for the extra carbohydrates; . . ."—*M. Ladd: Further experience with homogenized olive oil mixtures, Arch. Pediat., 33:501-512, July, 1916.*

In pyloric stenosis: "With low dextrose tolerance, a maltose dextrin preparation may be added in whole or in part. Even where the dextrose is well tolerated and gain in weight has ceased, impetus to the weight ontake may be given by the addition of a maltose dextrin preparation."—*D. J. Levy: Pyloric stenosis and pylorospasm of infancy with especial reference to medical treatment, J. Michigan St. M. S., 21:166-170, April, 1922.*

With reference to the treatment of diarrhea: "After several days, 2% to 3% of a maltose-dextrin preparation may be added (Dextri-Maltose). This is preferable to the easily fermentable lactose or cane sugar."—*F. Lust: The Treatment of Children's Diseases, J. B. Lippincott Co., Phila., 1930, p. 146.*

In dyspepsia: "The carbohydrate must not be allowed to exceed 3 per cent. Dextri-maltose is the most suitable sugar."

In the treatment of decomposition (atrophy, malnutrition, marasmus), ". . . when there has been obvious improvement, dextri-maltose is gradually increased from 3 to 5 per cent."—*B. Myers: The nutritional disturbances of infancy, Brit. M. J., 1:1079-1083, June 21, 1924.*

"The treatment of artificially fed children in the first of these groups consists in putting them on a low fat dietary, and giving them carbohydrate in the form of one of the less fermentable sugars—e.g., dextrimaltose."—*L. G. Parsons: Wasting disorders of early infancy, Lancet, 1:687-694, April 5, 1924.*

In the milder cases of inanition: "Regulation of this disturbed organismal balance is obtained by the addition of carbohydrates, while fat and casein are reduced. For this purpose dextrimaltose and flour are better than the ordinary sugars, since they are more slowly absorbed and have greater efficacy in their powers of controlling the flora in the large intestine."—*W. J. Pearson and W. G. Wyllie: Recent Advances in Diseases of Children, P. Blakiston's Son & Co., Phila., 1930, p. 116.*

In intestinal intoxication: "I have had more experience with dried skimmed milk in which 2 to 5 per cent dextrimaltose, barley or rice flour has been cooked, and the mixture subsequently fermented by lactic acid bacilli or soured with lactic acid, than with any other food except protein milk."—*G. F. Powers: A comprehensive plan of treatment for the so-called intestinal intoxication of infants, Am. J. Dis. Child., 32:252-257, August, 1926.*

Regarding the treatment of the marantic infant: "After the intolerance to sugar has been overcome a carbohydrate, preferably Dextri-maltose, may be added."—*C. S. Raue: Diseases of Children, Boericke & Tafel, Phila., 1922, p. 427.*

In spasmophilia: "Dextri maltose is the best sugar to use in these cases, in the proportion of 6 to 8 per cent."—*J. H. Reading, Jr.: Spasmophilia, Hahneman. Monthly, pp. 403-411, July, 1922.*

In the treatment of atrophy: "If the baby continues to improve, the next step in the treatment is to add to the milk one of the less fermentable carbohydrates, such as dextrimaltose; . . ."—*H. Thursfield and D. Paterson: Diseases of Children, William Wood & Co., 1929, p. 105.*

"I also find dextrin-maltose an excellent addition to albumin-milk when the first object of that food has been achieved and a gain in weight is desired; in this way I have succeeded in feeding albumin-milk far beyond the period usually advised, with highly gratifying results."—*F. L. Wachenheim: Infant-Feeding; Its Principles and Practice, Lea & Febiger, Phila., 1915, p. 158.*

"Dextri-maltose has been substituted for lactose not infrequently, when the tolerance for the latter continues low."—*I. H. West: Low fat, high starch evaporated milk feeding for the marasmic baby, Arch. Pediat. 48:189-193, March, 1931.*

"Malt sugar is indicated when others fail to produce a sufficient gain, or when malassimilation of fat is evident."—*O. H. Wilson: The role of carbohydrates in infant feeding, Southern M. J. 11:177, March, 1918; abst. Arch. Pediat. 35:447, July, 1918.*

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